AUTOMATIC TRANSAXLE SYSTEM

PRECAUTION

NOTICE:
Perform the RESET MEMORY procedures (A/T initialization) when replacing the automatic transaxle assembly, engine assembly or ECM (see page AX-18).
HINT:
RESET MEMORY cannot be completed by only reconnecting the cable to the negative (-) battery terminal.
CAUTION:
When using compressed air, always aim away from yourself to prevent Automatic Transmission Fluid (ATF) or kerosene from spraying on your face.
NOTICE:

- **The automatic transaxle is composed of precision-made parts, necessitating careful inspection before reassembly because even a small nick could cause fluid leakage or affect performance.**
- **The procedures are organized so that you work on only one component group at a time. This will help avoid confusion with similar-looking parts of different sub-assemblies being on your workbench at the same time.**
- **The component groups are inspected and repaired from the converter housing side.**
- **Whenever possible, complete the inspection, repair and reassembly before proceeding to the next component group. If a defect is found in a certain component group during reassembly, inspect and repair this group immediately. If a component group cannot be assembled because parts are being ordered, be sure to keep all parts of the group in a separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups.**
- **Use of Toyota Genuine ATF WS is recommended.**
- **All disassembled parts should be washed clean, and compressed air should be blown through any fluid passages and holes.**
- **Dry all parts with compressed air. Never use cloth.**
- **The recommended ATF or kerosene should be used for cleaning.**
- **After cleaning, the parts should be arranged in the order they were removed for efficient inspection, repairs, and reassembly.**
- **When disassembling a valve body, be sure to match each valve with its corresponding spring.**
- **New discs for the brakes and clutches that will be used for replacement must be soaked in ATF for at least 15 minutes before reassembly.**

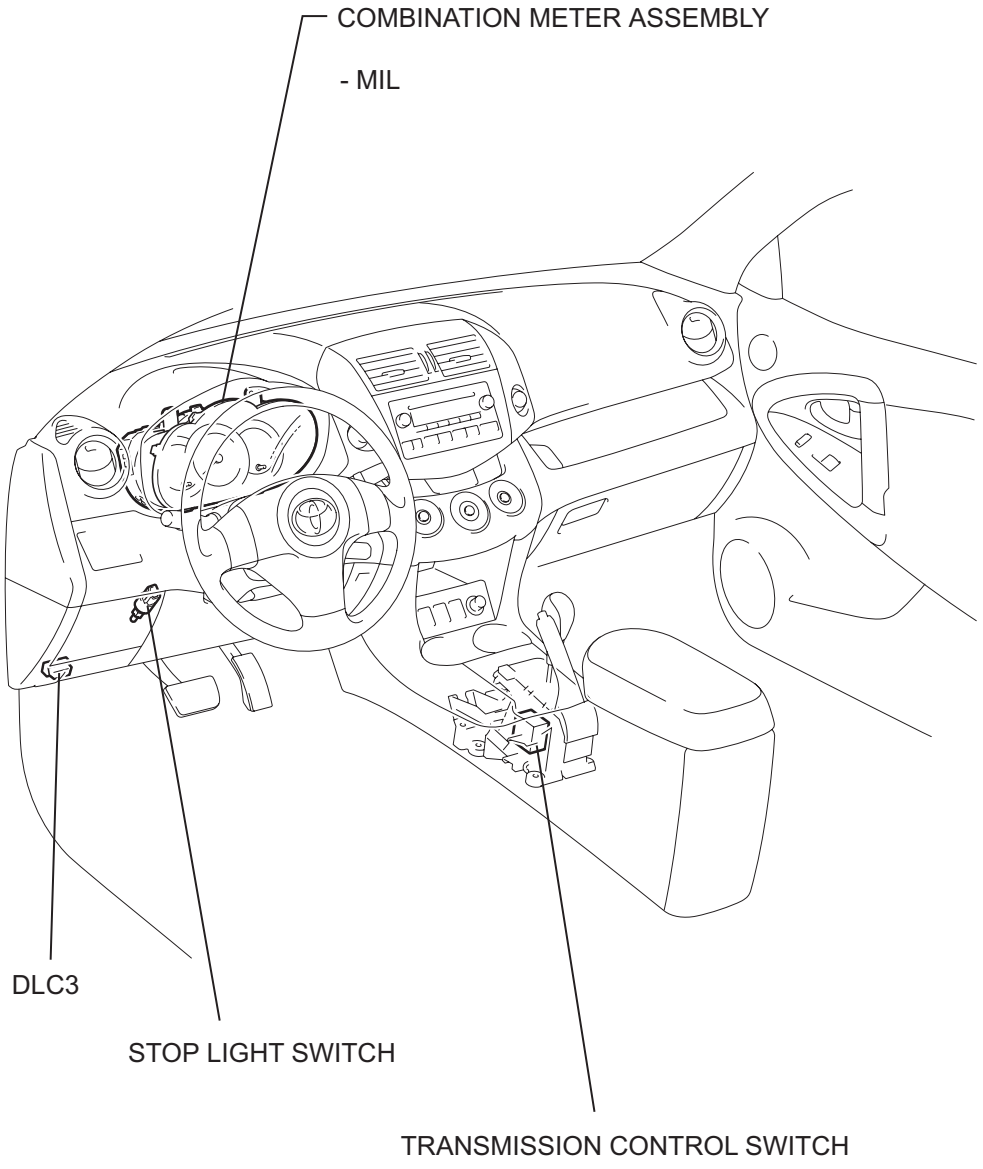
- **All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with ATF prior to reassembly.**
- **All old gaskets and rubber O-rings must be replaced.**
- **Do not apply adhesive cement to gaskets and similar parts.**
- **Make sure that the ends of the snap rings are not aligned with any cutouts. Also make sure that snap rings are correctly installed into the grooves.**
- **If a worn bushing is to be replaced, the sub-assembly containing the bushing must also be replaced.**
- **Check the thrust bearings and races for wear or damage. Replace them if necessary.**
- **Use petroleum jelly to keep parts in place.**
- **When working with FIPG material, perform the following:**
  Using a razor blade and gasket scraper, remove all old FIPG material from the gasket surface.
  Clean all components thoroughly to remove all foreign matter.
  Clean both sealing surfaces with a non-residue solvent.
  Apply FIPG material in a continuous line approximately 1 mm (0.04 in.) in diameter on the sealing surface.
  Reassemble parts within 10 minutes of applying FIPG material. Failing to do so will require the FIPG material to be removed and reapplied.

DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	Diagnostic code.
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. While another sensor is being monitored, the next sensor or component will not be monitored.
Required sensor/Components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. "Once per driving cycle" means that the ECM detects malfunction only 1 time during a single driving cycle. "Continuous" means that the ECM detects a malfunction every time the enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the "typical enabling conditions" are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediate" means that the ECM illuminates the MIL the instant the ECM determines that there is a malfunction. "2 driving cycle" means that the ECM illuminates the MIL if the same malfunction is detected again in the 2nd driving cycle.
Component operating range	Normal operation range of sensors and solenoids under normal driving conditions. Use these ranges as a reference. They cannot be used to judge if a sensor or solenoid is defective or not.

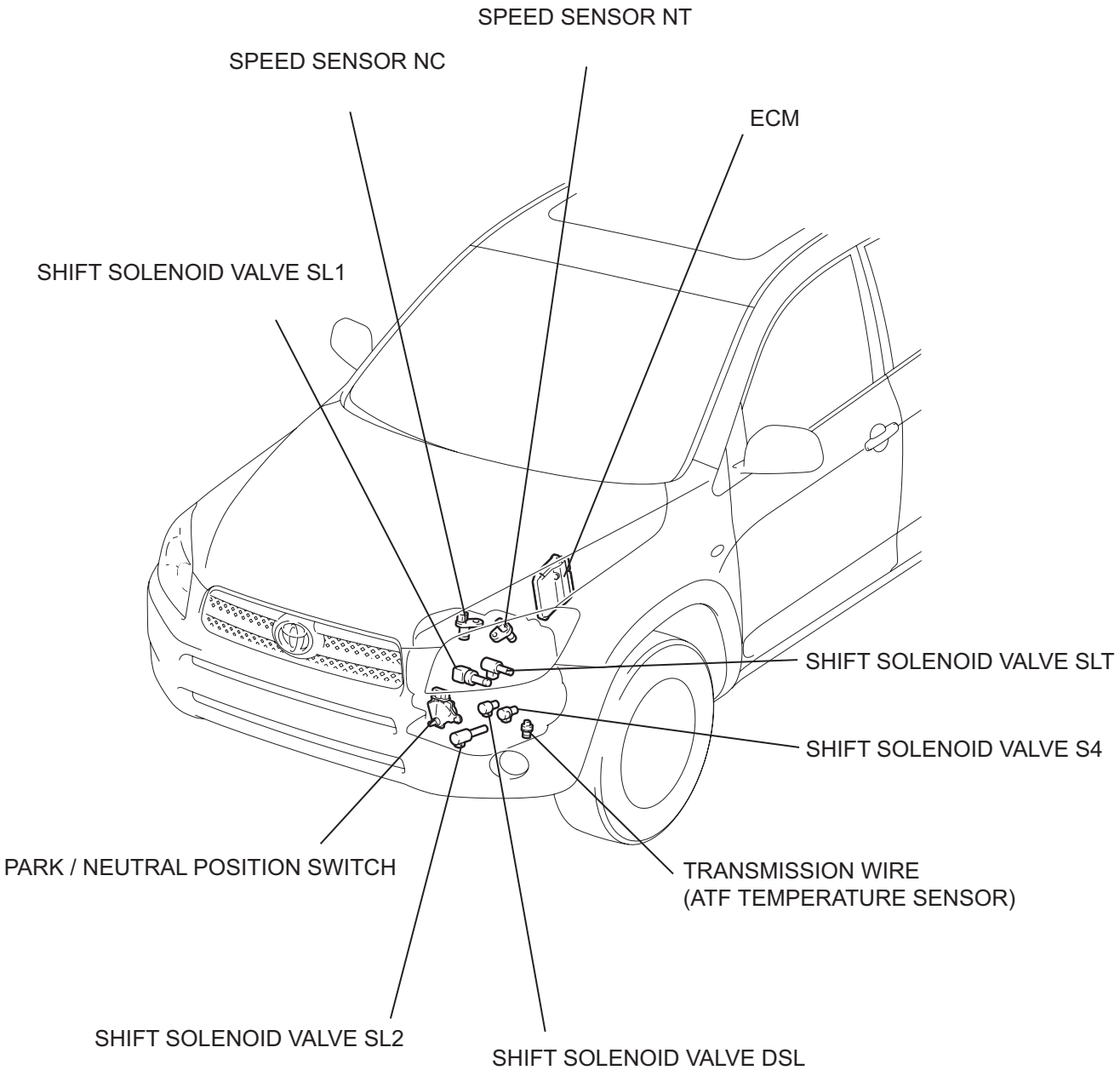
PARTS LOCATION

AX



P

C127571E03



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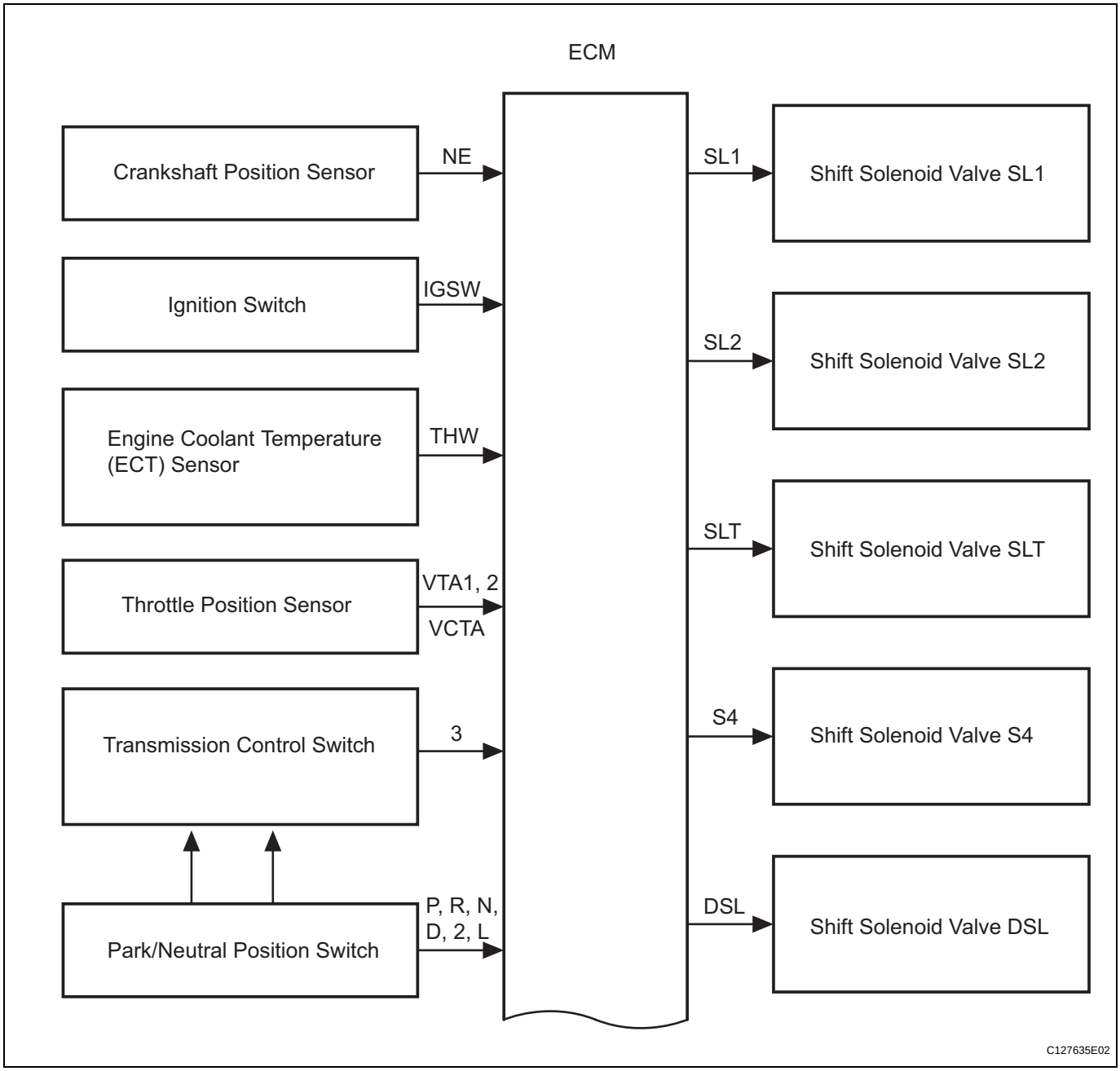
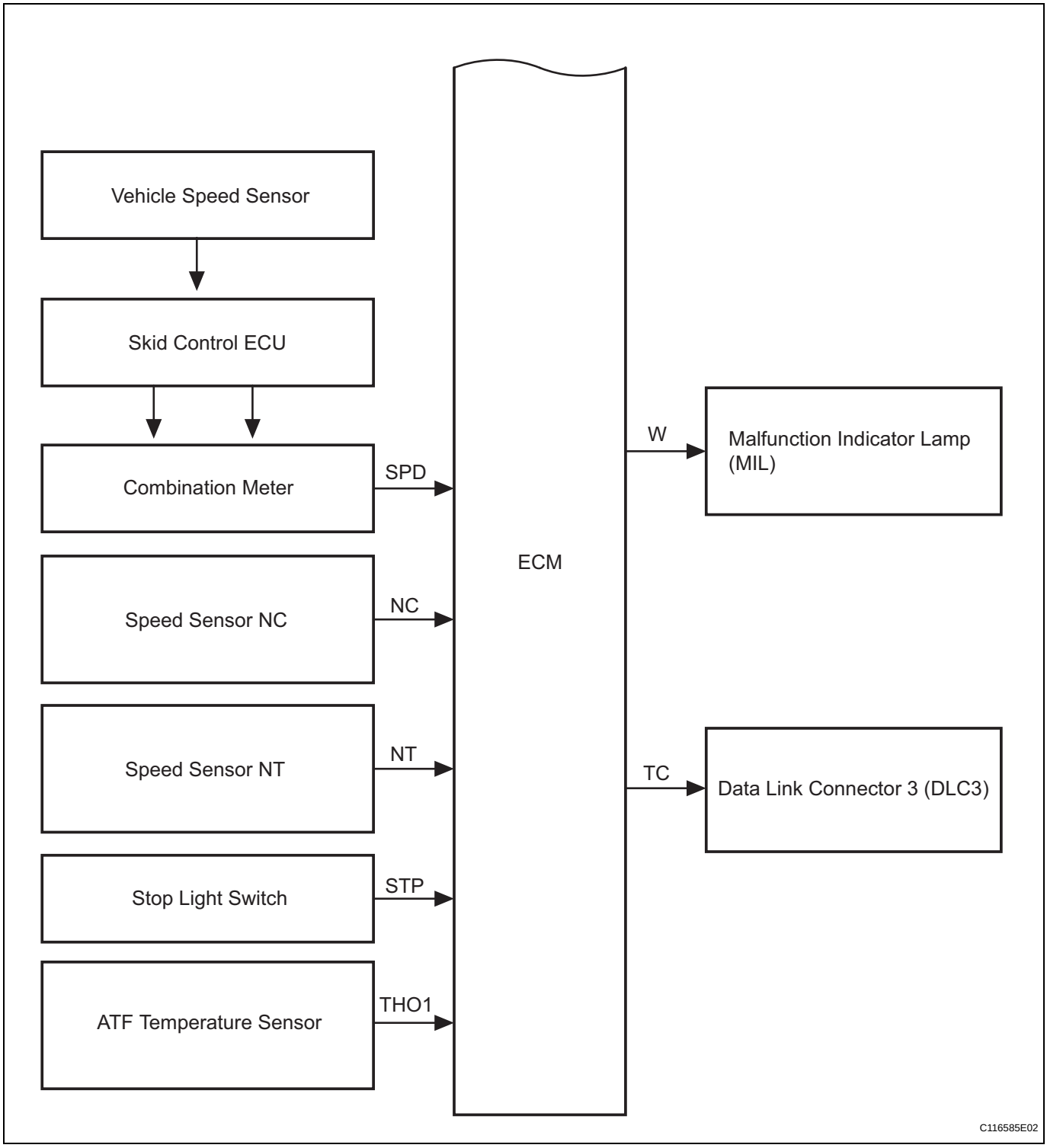
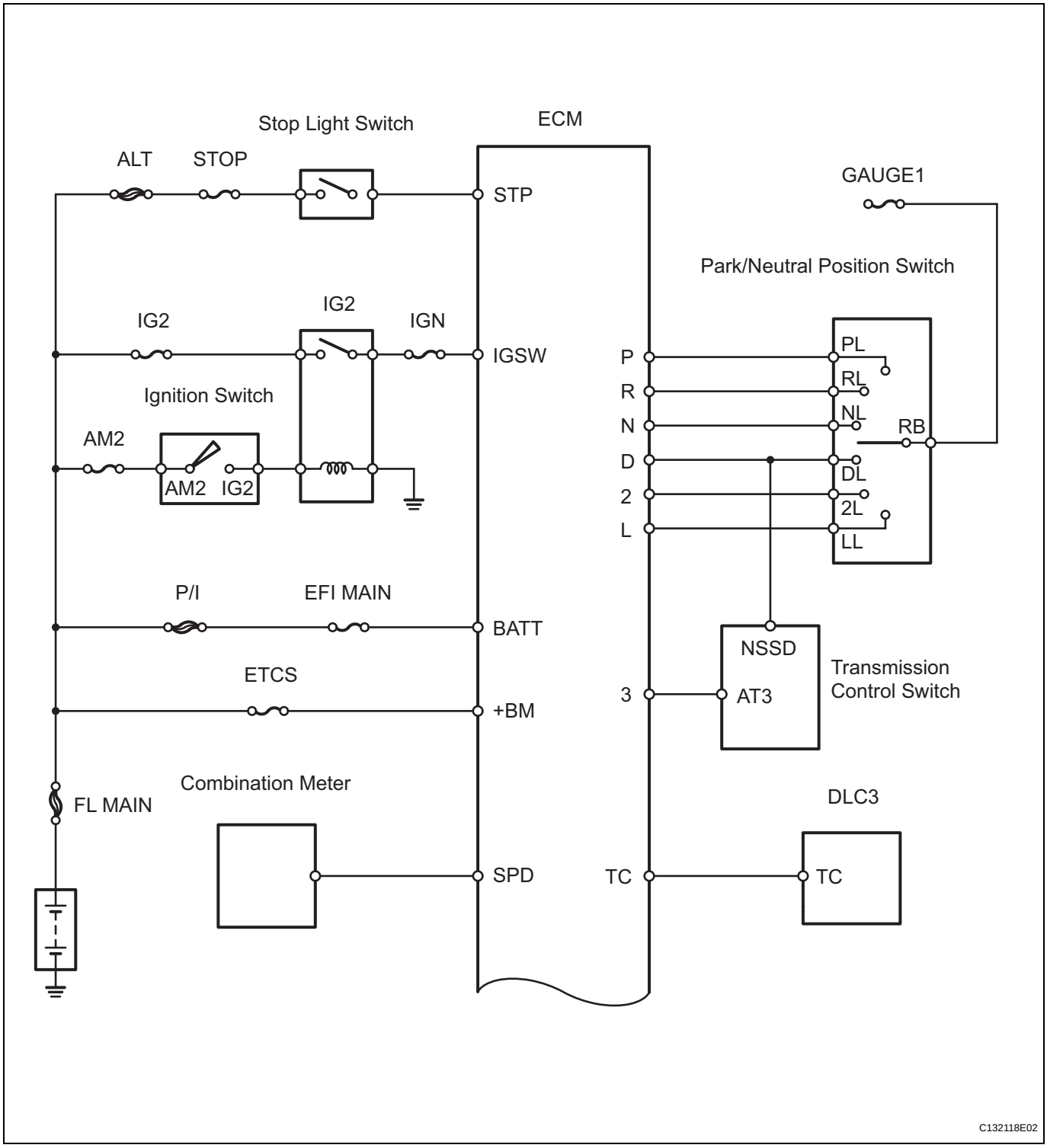
SYSTEM DIAGRAM

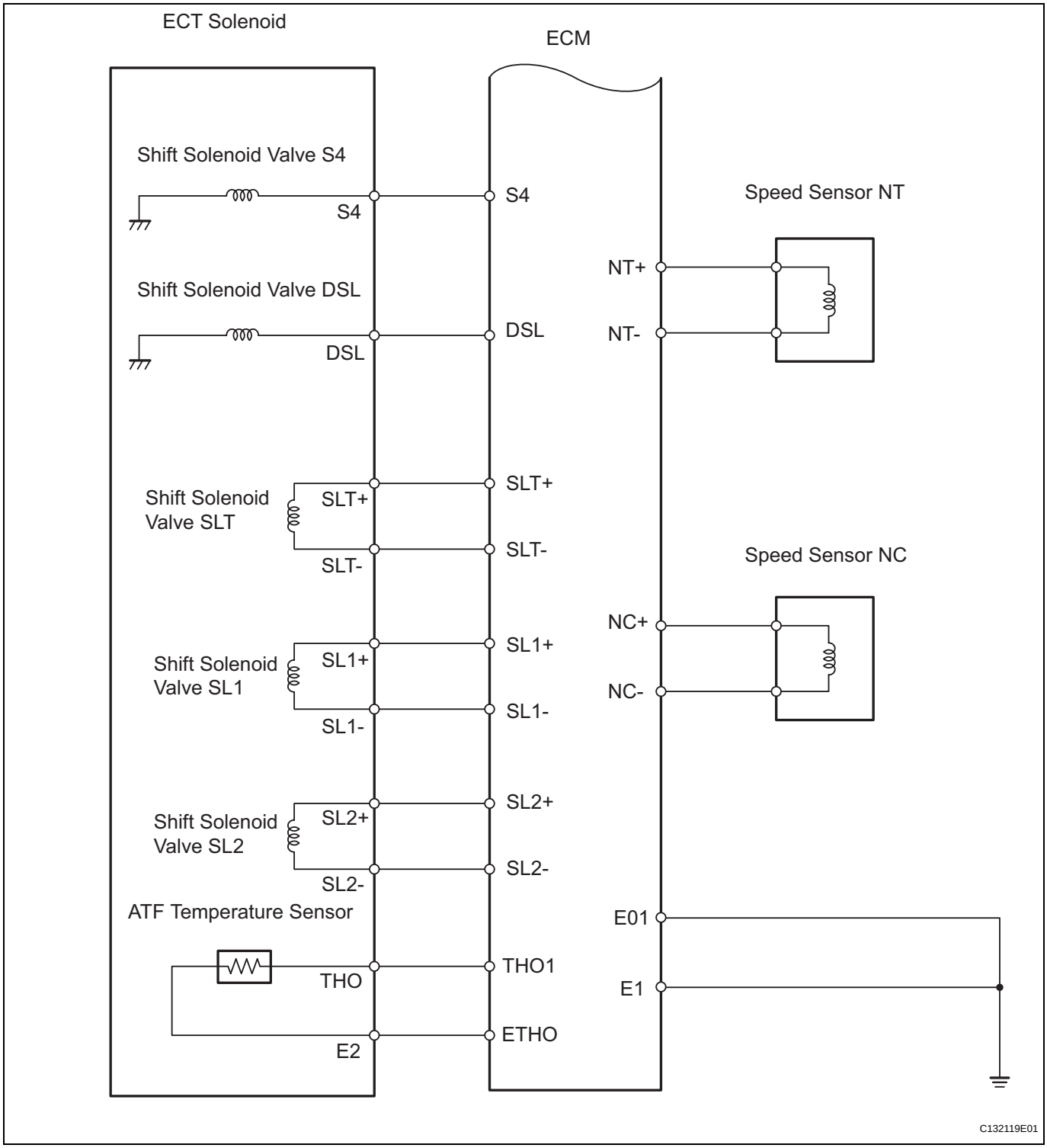
The configuration of the electronic control system in the U241E automatic transaxle is as shown in the following chart.




Vehicle Speed Sensor
Skid Control ECU
Combination Meter
Speed Sensor NC
Speed Sensor NT
Stop Light Switch
ATF Temperature Sensor
SPD
NC
NT
STP
THO1
ECM
W
Malfunction Indicator Lamp (MIL)
TC
Data Link Connector 3 (DLC3)
C116585E02

AX


Stop Light Switch
ECM
ALT
STOP
STP
GAUGE1
Park/Neutral Position Switch
IG2
IG2
IGN
IGSW
P
R
N
D
2
L
PL
RL
NL
RB
DL
2L
LL
Ignition Switch
AM2
AM2
IG2
P/I
EFI MAIN
BATT
NSSD
Transmission
Control Switch
ETCS
+BM
3
AT3
Combination Meter
FL MAIN
DLC3
SPD
TC
TC
C132118E02


ECT Solenoid
ECM
Shift Solenoid Valve S4
S4
S4
Speed Sensor NT
NT+
NT-
Shift Solenoid Valve DSL
DSL
DSL
Shift Solenoid Valve SLT
SLT+
SLT-
SLT+
SLT-
Speed Sensor NC
NC+
NC-
Shift Solenoid Valve SL1
SL1+
SL1-
SL1+
SL1-
Shift Solenoid Valve SL2
SL2+
SL2-
SL2+
SL2-
ATF Temperature Sensor
THO
E2
THO1
ETHO
E01
E1
C132119E01

AX

SYSTEM DESCRIPTION

1. SYSTEM DESCRIPTION

(a) The Electronic Controlled Automatic Transaxle (ECT) is an automatic transaxle that electronically controls shift timing using the Engine Control Module (ECM). The ECM detects electrical signals that indicate engine and driving conditions, and controls the shift point based on driver habits and road conditions. As a result, fuel efficiency and power transaxle performance are improved.
Shift shock is reduced by controlling the engine and transaxle simultaneously.
In addition, the ECT has the following features:

- Diagnostic function.
- Fail-safe function when a malfunction occurs.

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- The ECM of this system is connected to the CAN and multiplex communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the CAN and multiplex communication systems.
- *: Use the intelligent tester.

1	VEHICLE BROUGHT TO WORKSHOP

NEXT

2	CUSTOMER PROBLEM ANALYSIS

NEXT

3	INSPECT BATTERY VOLTAGE

Standard voltage:
11 to 14 V

If the voltage is below 11 V, recharge or replace the battery before proceeding.

NEXT

4	CONNECT INTELLIGENT TESTER TO DLC3*

NEXT

5	CHECK AND CLEAR DTCS AND FREEZE FRAME DATA*

(a) Refer to the DTC CHECK / CLEAR (see page AX-29).

NEXT

6	VISUAL INSPECTION

NEXT

7	SETTING CHECK MODE DIAGNOSIS*

(a) Refer to the CHECK MODE PROCEDURE (see page AX-30).

NEXT

8	PROBLEM SYMPTOM CONFIRMATION

(a) Refer to the ROAD TEST (see page AX-12).

Result

Result	Proceed to
Symptom does not occur	A
Symptom occurs	B

B → GO TO STEP 10

A

9	SYMPTOM SIMULATION

(a) Refer to the ELECTRONIC CIRCUIT INSPECTION PROCEDURE (see page IN-37).

NEXT

10	DTC CHECK*

(a) Refer to the DTC CHECK / CLEAR (see page AX-29).

Result

Result	Proceed to
DTC is not output	A
DTC is output	B

B → GO TO STEP 18

A

11	BASIC INSPECTION

(a) Refer to the AUTOMATIC TRANSMISSION FLUID (see page AX-102).

(b) Refer to the PARK/NEUTRAL POSITION SWITCH (see page AX-108).

(c) Refer to the FLOOR SHIFT ASSEMBLY (see page AX-136).

NG → GO TO STEP 21

OK

12	MECHANICAL SYSTEM TESTS

(a) Refer to the MECHANICAL SYSTEM TESTS (see page AX-15).

NG → GO TO STEP 17

OK

13 HYDRAULIC TEST

(a) Refer to the HYDRAULIC TEST (see page AX-16).

NG → GO TO STEP 17

OK

14 MANUAL SHIFTING TEST

(a) Refer to the MANUAL SHIFTING TEST (see page AX-17).

NG → GO TO STEP 16

OK

15 PROBLEM SYMPTOMS TABLE CHAPTER 1

(a) Refer to the PROBLEM SYMPTOMS TABLE (see page AX-21).

NG → GO TO STEP 19

OK

16 PROBLEM SYMPTOMS TABLE CHAPTER 2

(a) Refer to the PROBLEM SYMPTOMS TABLE (see page AX-21).

NEXT

17 PART INSPECTION

NG → GO TO STEP 21

OK

18 DTC CHART

(a) Refer to the DIAGNOSTIC TROUBLE CODE CHART (see page AX-35).

NEXT

19	CIRCUIT INSPECTION

NEXT

AX

20	IDENTIFICATION OF PROBLEM

NEXT

21	REPAIR OR REPLACE

NEXT

22	CONFIRMATION TEST

NEXT

END

ROAD TEST

1. PROBLEM SYMPTOM CONFIRMATION

(a) Based on the result of the customer problem analysis, try to reproduce the symptoms. If the problem is that the transaxle does not shift up, shift down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and simulate the problem symptoms.

2. ROAD TEST

NOTICE:

Perform the test at the normal operating ATF temperature of 50 to 80°C (122 to 176°F).

(a) D position test

Move the shift lever to D and fully depress the accelerator pedal. Check the following:

(1) Check up-shift operation.

Check that the 1 → 2, 2 → 3 and 3 → O/D up-shifts take place at the shift point shown in the automatic shift schedule (see page SS-60).

HINT:

O/D Gear Up-shift Prohibition Control

- Engine coolant temperature is 55°C (131°F) or less and vehicle speed is at 70 km/h (43 mph) or less.
- ATF temperature is 5°C (41°F) or less.

O/D Gear Lock-up Prohibition Control

- Brake pedal is depressed.
- Accelerator pedal is released.
- Engine coolant temperature is 60°C (140°F) or less.

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up-shifts.

(3) Check for abnormal noise and vibration.

Check for abnormal noise and vibration when up-shifting from 1 → 2, 2 → 3 and 3 → O/D while driving with the shift lever on D, and check while driving in the lock-up condition.

HINT:

The check for the cause of abnormal noise and vibration must be done thoroughly as it could also be due to loss of balance in the differential, torque converter clutch, etc.

(4) Check kick-down operation.

While driving the vehicle in the 2nd, 3rd and O/D gears with the shift lever on D, check that the possible kick-down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick-downs conform to those indicated in the automatic shift schedule (see page SS-60).

(5) Check for abnormal shock and slip at kick-down.

(6) Check the lock-up mechanism.
- Drive the vehicle in the O/D gear with the shift lever on D. Maintain a steady speed (lock-up ON).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:
- There is no lock-up function in the 1st and 2nd gear.
- If there is a sudden increase in engine speed, there is no lock-up.

(b) 3 position test

Move the shift lever to 3 and fully depress the accelerator pedal. Check the following:

(1) Check up-shift operation.
Check that the 1 → 2 and 2 → 3 up-shifts take place and that the shift point conforms to the automatic shift schedule (see page SS-60).

(2) Check engine braking.
While driving the vehicle in the 3rd gear with the shift lever on 3, release the accelerator pedal and check the engine braking effect.

(3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.

(c) 2 position test

Move the shift lever to 2 and fully depress the accelerator pedal. Check the following:

(1) Check up-shift operation.
Check that the 1 → 2 up-shift takes place and that the shift point conforms to the automatic shift schedule (see page SS-60).
HINT:
There is no O/D up-shift and lock-up when the shift lever is on 2.

(2) Check engine braking.
While driving the vehicle in the 2nd gear with the shift lever on 2, release the accelerator pedal and check the engine braking effect.

(3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.

(d) L position test

Move the shift lever to L and fully depress the accelerator pedal. Check the following:

(1) Check that there is no up-shift.
While driving the vehicle with the shift lever on L, check that there is no up-shift to 2nd gear.
HINT:
There is no lock-up in L.

(2) Check engine braking.
While driving the vehicle with the shift lever on L, release the accelerator pedal and check the engine braking effect.

(3) Check for abnormal noises during acceleration and deceleration.

(e) R position test
Move the shift lever to R and lightly depress the accelerator pedal. Check that the vehicle moves backward without any abnormal noise or vibration.
CAUTION:
Before conducting this test, ensure that no people or obstacles are in the test area.

(f) P position test
Stop the vehicle on an incline (more than 5°). Then move the shift lever to P and release the parking brake. Check that the parking lock pawl holds the vehicle in place.

MECHANICAL SYSTEM TESTS

1. STALL SPEED TEST

HINT:

This test is to check the overall performance of the engine and transaxle.

NOTICE:

- **Do not perform the stall speed test longer than 5 seconds.**
- **To ensure safety, perform this test in an open and level area that provides good traction.**
- **The stall speed test should always be performed with at least 2 people. One person should observe the condition of the wheels and wheel chocks while the other is performing the test.**

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(b) Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

(c) Allow the engine to idle with the air conditioning OFF.

(d) Chock all 4 wheels.

(e) Set the parking brake and keep the brake pedal depressed firmly with your left foot.

(f) Move the shift lever to the D position.

(g) Depress the accelerator pedal as much as possible with your right foot.

(h) Read the engine rpm (stall speed) and release the accelerator pedal immediately.

Standard value:

2,150 to 2,450 rpm

Evaluation:

Test Result	Possible Cause
Stall speed is lower than standard value	• Stator one-way clutch is not operating properly • Torque converter is faulty (stall speed is less than standard value by 600 rpm or more) • Engine power may be insufficient
Stall speed is higher than standard value	• Line pressure is low • C1 clutch slipping • F3 one-way clutch is not operating properly • F4 one-way clutch is not operating properly

NOTICE:

Perform the test at the normal operating ATF temperature of 50 to 80°C (122 to 176°F).

2. SHIFT TIME LAG TEST

HINT:

This test is to check the condition of the direct clutch, forward clutch, 1st brake and reverse brake.

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

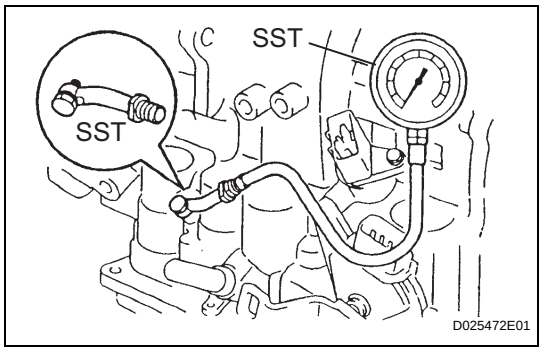
(b) Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

(c) Allow the engine to idle with the air conditioning OFF.

(d) Set the parking brake and keep the brake pedal depressed firmly.
(e) Check the D range time lag.
  (1) Move the shift lever to N and wait for 1 minute.
  (2) Move the shift lever to D and measure the time until the shock is felt.
  (3) Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.
(f) Check the R range time lag.
  (1) Move the shift lever to N and wait for 1 minute.
  (2) Move the shift lever to R and measure the time until the shock is felt.
  (3) Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.
  Standard value:
  D range time lag is less than 1.2 seconds
  R range time lag is less than 1.5 seconds

Evaluation:

Test Result	Possible Cause
D range time lag exceeds standard value	• Line pressure is low • C1 clutch is worn • F3 one-way clutch is not operating properly • F4 one-way clutch is not operating properly
R range time lag exceeds standard value	• Line pressure is low • C3 clutch is worn • B4 brake is worn • F1 one-way clutch is not operating properly



HYDRAULIC TEST

1. MEASURE LINE PRESSURE

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **The line pressure test should always be performed with at least 2 people. One person should observe the condition of the wheels or wheel chocks while the other is performing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**
- **This test must be performed after checking and adjusting the engine.**
- **Perform the test with the A/C OFF.**
- **When conducting the stall test, do not continue for more than 10 seconds.**

(a) Warm up the ATF.
(b) Remove the test plug on the transaxle case center right side and connect SST.
  SST 09992-00095 (09992-00231, 09992-00271)
(c) Fully apply the parking brake and chock the 4 wheels.
(d) Start the engine and check the idling speed.
(e) Keep your left foot firmly on the brake pedal and move the shift lever to D.
(f) Measure the line pressure when the engine is idling.

(g) Depress the accelerator pedal as much as possible with your right foot. Quickly read the highest line pressure reading when the engine speed reaches stall speed.
(h) Perform the measure line pressure test again with the shift lever on R.

Specified line pressure:

AX

Condition	Shift Lever on D	Shift Lever on R
Idling	372 to 412 kPa (3.8 to 4.2 kgf/cm^2, 54 to 60 psi)	672 to 742 kPa (6.9 to 7.6 kgf/cm^2, 97 to 108 psi)
Stall	931 to 1,031 kPa (9.5 to 10.5 kgf/cm^2, 135 to 150 psi)	1,768 to 1,968 kPa (18.0 to 20.0 kgf/cm^2, 256 to 285 psi)

Evaluation:

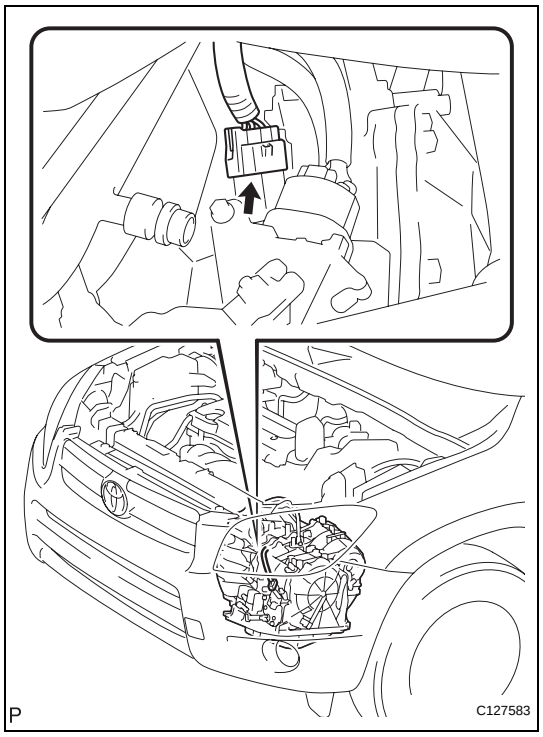
Problem	Possible Cause
Measured values at all positions are higher than specified	• Shift solenoid valve SLT defective • Regulator valve defective
Measured values at all positions are lower than specified	• Shift solenoid valve SLT defective • Regulator valve defective • Oil pump defective • U/D (underdrive) direct clutch defective
Pressure is low when shift lever is on D only	• D position circuit fluid leak • Forward clutch defective
Pressure is low when shift lever is on R only	• R position circuit fluid leak • Direct clutch defective • 1st and reverse brake defective

MANUAL SHIFTING TEST

1. MANUAL SHIFTING TEST

HINT:

- Through this test, it can be determined whether the trouble occurs in the electrical circuit or if it is a mechanical problem in the transaxle.
- If any abnormalities are found in the following test, the problem is in the transaxle itself.



(a) Disconnect the connector of the transmission wire.
HINT:
It is possible to deactivate the electrical shift control by disconnecting the transmission wire. The gear positions can then be changed mechanically with the shift lever.

(b) Drive with the transmission wire disconnected. Move the shift lever to each position to check whether the gear position changes as shown in the table below.

Shift Lever Position	Gear Position
D	3rd
2	3rd
L	3rd
R	R
P	P

(c) Connect the connector of the transmission wire.

(d) Clear the DTC (see page AX-29).

INITIALIZATION

1. RESET MEMORY

NOTICE:

- **Perform the RESET MEMORY procedures (A/T initialization) when replacing the automatic transaxle assembly, engine assembly or ECM.**
- **RESET MEMORY can be performed only with the intelligent tester.**

HINT:

The ECM memorizes the vehicle conditions when the ECT controls the automatic transaxle assembly and engine assembly. Therefore, when the automatic transaxle assembly, engine assembly, or ECM has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information.

The reset procedures are as follows.

(a) Turn the ignition switch OFF.

(b) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(c) Turn the ignition switch ON and turn the tester ON.

(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II.

(e) Perform the reset memory procedures from the Engine menu.

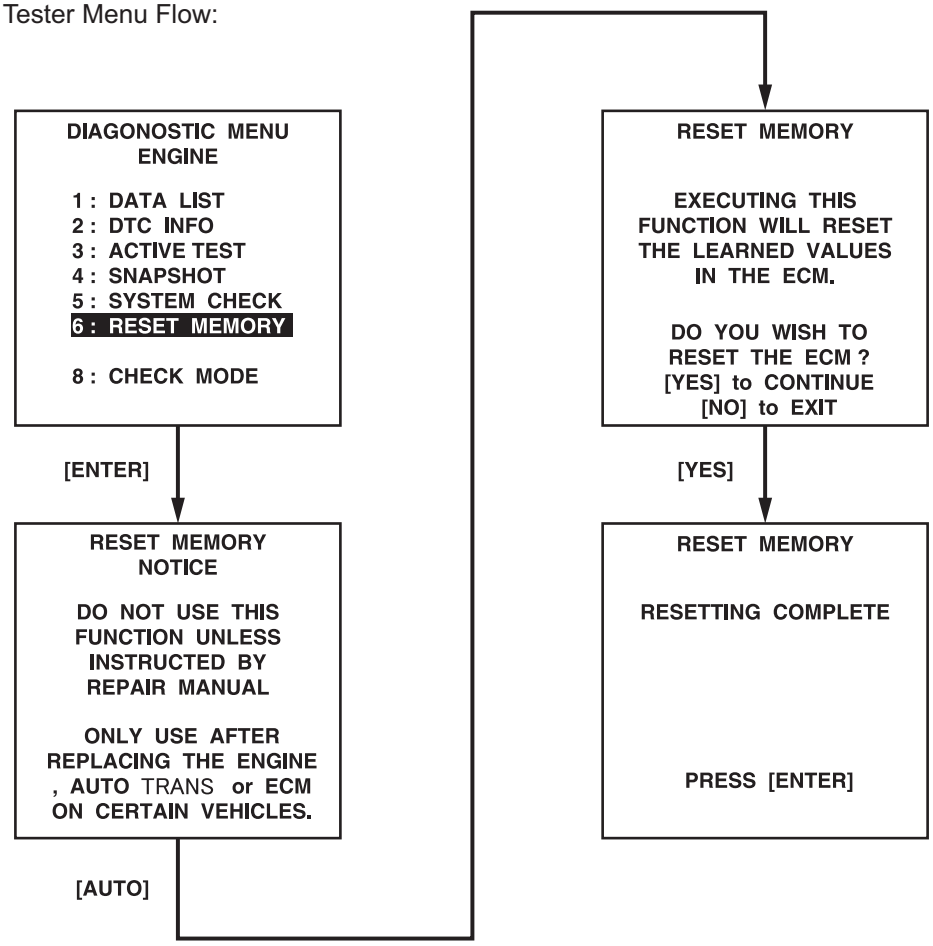
CAUTION:

After performing the RESET MEMORY procedures, be sure to perform the ROAD TEST (see page AX-12) as described earlier.

HINT:

The ECM learns through the ROAD TEST.

Tester Menu Flow:



P

C115865E02

MONITOR DRIVE PATTERN

1. TEST MONITOR DRIVE PATTERN FOR ECT

CAUTION:

Perform this drive pattern on a level surface and strictly observe the posted speed limits and traffic laws while driving.

HINT:

Performing this drive pattern is one method to simulate the ECT's malfunction detection conditions.

The DTCs may not be detected through ordinary, everyday driving. Also, DTCs may not be detected through this drive pattern.

(a) Preparation for driving

(1) Warm up the engine sufficiently (engine coolant temperature is 60°C (140°F) or higher).

(2) Drive the vehicle when the atmospheric temperature is -10°C (14°F) or higher. Malfunction is not detected when the atmospheric temperature is less than -10°C (14°F).

(b) Drive pattern

(1) Drive the vehicle through all the gears. Stop → 1st → 2nd → 3rd → O/D → O/D (lock-up ON).

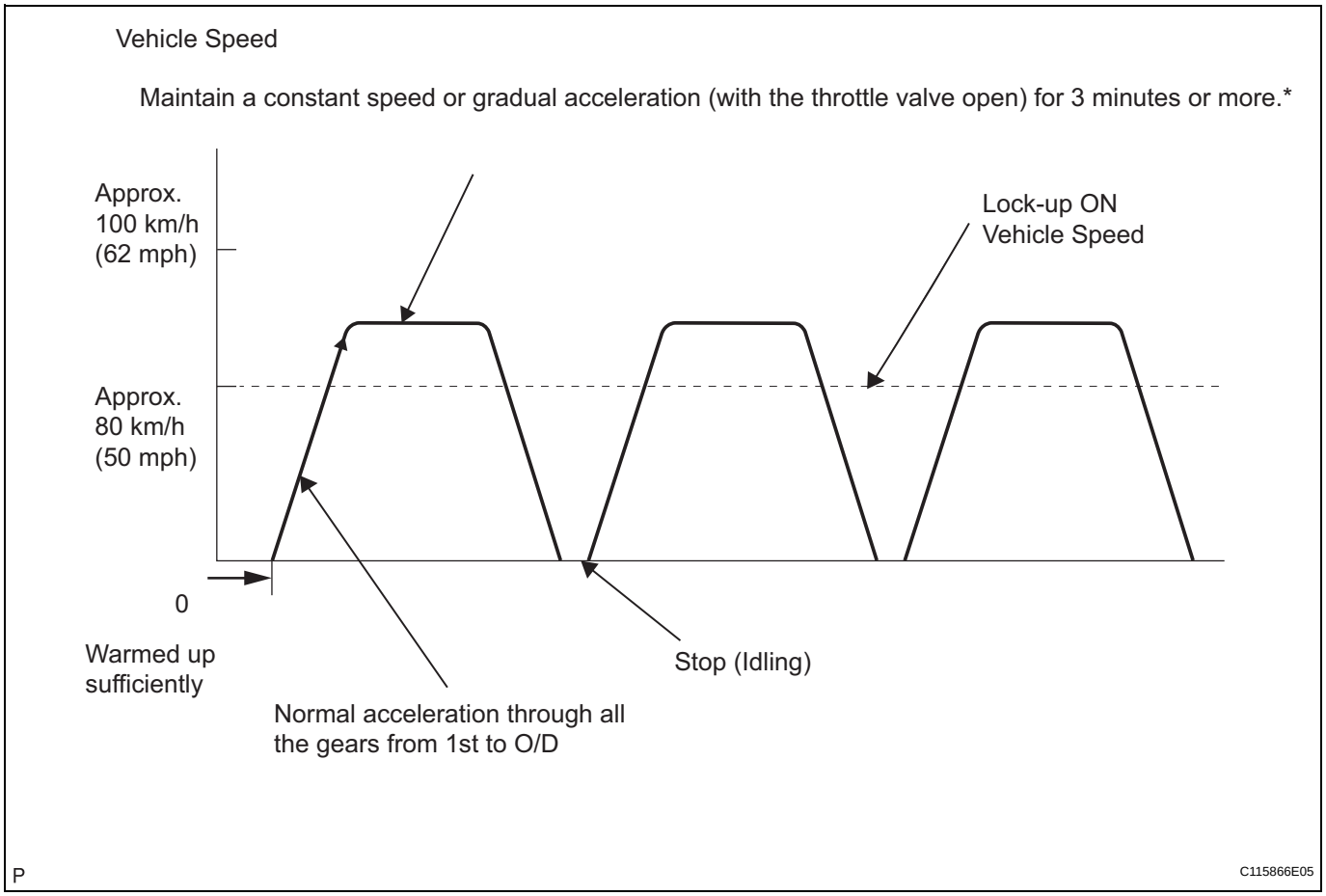
(2) Repeat the above drive pattern 3 times or more.

NOTICE:

- **When using the intelligent tester, the monitor status can be found in "ENHANCED OBD II / DATA LIST" or under "CARB OBD II".**
- **In the event that the drive pattern must be interrupted (due to traffic conditions or other factors), the drive pattern can be resumed and, in most cases, the monitor can be completed.**

CAUTION:

Perform this drive pattern on a level road as much as possible and strictly observe the posted speed limits and traffic laws while driving.



HINT:
*: Drive at such a speed in the uppermost gear to engage lock-up. The vehicle can be driven at a speed lower than the speed shown in the above diagram under the lock-up condition.

NOTICE:

It is necessary to drive the vehicle for approximately 30 minutes to detect DTC P0711 (Transmission fluid temperature sensor "A" performance).

AX

PROBLEM SYMPTOMS TABLE

HINT:

- Use the table below to help determine the cause of the problem symptom. The potential causes of the symptoms are listed in order of probability in the "Suspected area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.
- The Matrix Chart is divided into 2 chapters. When troubleshooting, check Chapter 1 first. If instructions are given in Chapter 1 to proceed to 2, proceed as instructed.
- If the instruction "Proceed to next circuit inspection shown in problem symptoms table" is given in the flowchart for each circuit, proceed to the next suspected area in the table.
- If the problem still occurs even though there are no malfunctions in any of the circuits, check the ECM and replace it if necessary.

CHAPTER 1: ELECTRICAL CIRCUIT MATRIX CHART

Symptom	Suspected area	See page
No up-shift (1st -> 2nd)	ECM	IN-37
No up-shift (2nd -> 3rd)	ECM	IN-37
No up-shift (3rd -> O/D)	1. Park/Neutral position switch circuit*	AX-39
	2. ECM	IN-37
No down-shift (O/D -> 3rd)	ECM	IN-37
No down-shift (3rd -> 2nd)	ECM	IN-37
No down-shift (2nd -> 1st)	ECM	IN-37
No lock-up or no lock-up off	ECM	IN-37
Shift point too high or too low	ECM	IN-37
Up-shift to O/D from 3rd while shift lever is on 3	1. Park/Neutral position switch circuit*	AX-39
	2. ECM	IN-37
Up-shift to O/D from 3rd while engine is cold	1. Engine coolant temp. sensor circuit*	ES-51
	2. ECM	IN-37
Harsh engagement (N -> D)	ECM	IN-37
Harsh engagement (lock-up)	ECM	IN-37
Harsh engagement (any driving position)	ECM	IN-37
Poor acceleration	ECM	IN-37
Engine stalls when starting off or stopping	ECM	IN-37
Malfunction in shifting	1. Park/Neutral position switch circuit*	AX-39
	2. ECM	IN-37

HINT:

*: When the circuit is defective, a DTC may be output.

CHAPTER 2: ON-VEHICLE REPAIR AND OFF-VEHICLE REPAIR

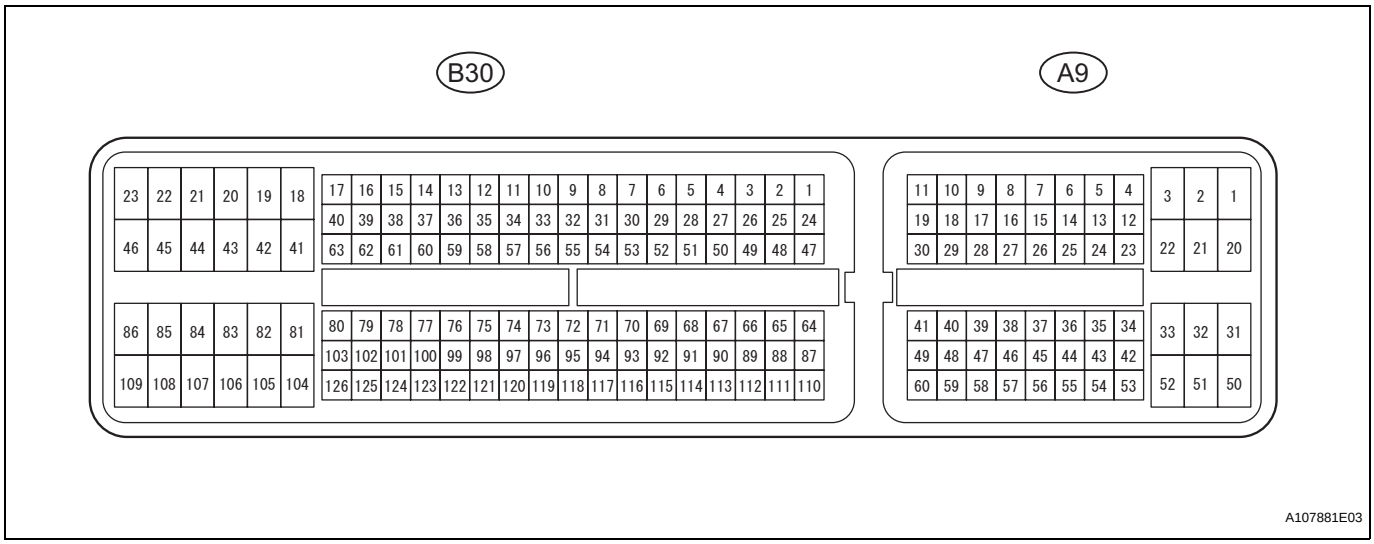
Symptom	Suspected area	See page
Vehicle does not move in all positions other than P and N	1. Manual valve	AX-154
	2. Primary regulator valve	AX-154
	3. Front and rear planetary gear	AX-154
	4. U/D planetary gear	AX-154
	5. F2 U/D one-way clutch	AX-154
	6. C1 forward clutch	AX-154
	7. B3 U/D brake	AX-154

Symptom	Suspected area	See page
Vehicle does not move with shift lever on R	1. Front and rear planetary gear	AX-154
	2. U/D planetary gear	AX-154
	3. C2 direct clutch	AX-154
	4. C3 U/D brake	AX-154
	5. B2 1st and reverse brake	AX-154
No up-shift (1st -> 2nd)	1. Valve body assembly	AX-118
	2. F1 No. 1 one-way clutch	AX-154
	3. B1 2nd brake	AX-154
No up-shift (2nd -> 3rd)	1. Valve body assembly	AX-118
	2. C2 direct clutch	AX-154
No up-shift (3rd -> O/D)	1. 3-4 shift valve	AX-154
	2. C3 U/D clutch	AX-154
No down-shift (O/D -> 3rd)	3-4 shift valve	AX-154
No down-shift (3rd -> 2nd)	Valve body assembly	AX-118
No down-shift (2nd -> 1st)	Valve body assembly	AX-118
No lock-up or no lock-up off	1. Lock-up relay valve	AX-154
	2. Torque converter clutch	AX-152
Harsh engagement (N -> D)	1. C1 accumulator	AX-154
	2. Valve body assembly	AX-118
	3. C1 forward clutch	AX-154
	4. F2 U/D one-way clutch	AX-154
	5. F1 No. 1 one-way clutch	AX-154
Harsh engagement (N -> R)	1. Valve body assembly	AX-118
	2. C2 direct clutch	AX-154
	3. B2 1st and reverse brake	AX-154
Harsh engagement (Lock-up)	1. Lock-up relay valve	AX-154
	2. Torque converter clutch	AX-152
Harsh engagement (2nd -> 3rd)	Valve body assembly	AX-118
Harsh engagement (3rd -> O/D)	Valve body assembly	AX-118
Harsh engagement (O/D -> 3rd)	Valve body assembly	AX-118
Slip or shudder (forward position, after warm-up)	1. Oil strainer	AX-118
	2. Torque converter clutch	AX-152
	3. C1 forward clutch	AX-154
	4. C2 direct clutch	AX-154
	5. C3 U/D brake	AX-154
	6. F1 No. 1 one-way clutch	AX-154
	7. F2 U/D one-way clutch	AX-154
Slip or shudder (shift lever on R)	1. Oil strainer	AX-118
	2. C2 direct clutch	AX-154
	3. B2 1st and reverse brake	AX-154
Slip or shudder (1st)	F1 No. 1 one-way clutch	AX-154
Slip or shudder (2nd)	1. F2 U/D one-way clutch	AX-154
	2. B1 2nd brake	AX-154
Slip or shudder (3rd)	C2 direct clutch	AX-154
Slip or shudder (O/D)	C3 U/D clutch	AX-154
No engine braking (1st to 3rd/shift lever on D)	B3 U/D brake	AX-154
No engine braking (1st/shift lever on L)	B2 1st and reverse brake	AX-154
No engine braking (2nd/shift lever on 2)	B1 2nd brake	AX-154

Symptom	Suspected area	See page
Poor acceleration (all positions)	1. Torque converter clutch	AX-152
	2. U/D planetary gear	AX-154
Poor acceleration (O/D)	1. C3 U/D clutch	AX-154
	2. U/D planetary gear	AX-154
Large shift shock or engine stalls when starting off or stopping	Torque converter clutch	AX-152
No kick-down	Valve body assembly	AX-118

TERMINALS OF ECM

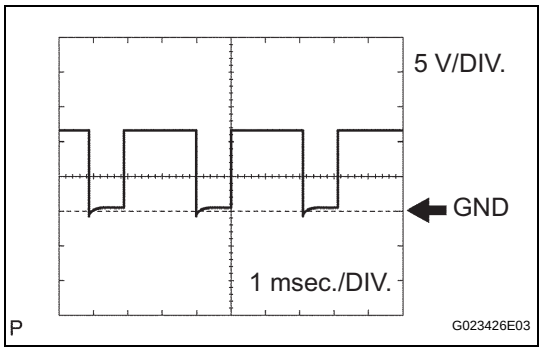
1. CHECK ECM



(a) Measure the voltage of the ECM connector.
HINT:
Each ECM terminal's standard voltage is shown in the table below.
In the table, first follow the information under "Condition". Look under "Symbols (Terminal No.)" for the terminals to be inspected. The standard voltage between the terminals is shown under "Specified Condition".
Use the illustration above as a reference for the ECM terminals.

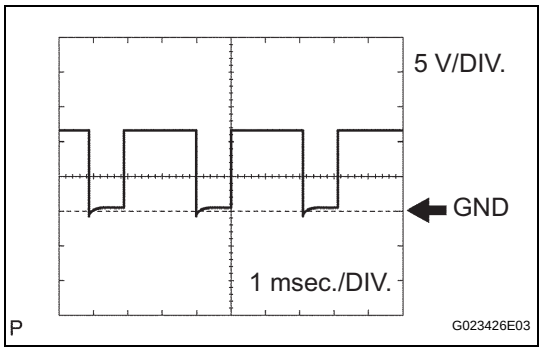
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
STAR (B30-52) - E1 (B30-104)	W - BR	Park/Neutral position switch signal	Ignition switch ON and shift lever on P or N	Below 2 V
STAR (B30-52) - E1 (B30-104)	W - BR	Park/Neutral position switch signal	Ignition switch ON and shift lever not on P or N	10 to 14 V
P (B30-73) - E1 (B30-104)	L - BR	P shift position switch signal	Ignition switch ON and transfer shift lever on P	10 to 14 V
P (B30-73) - E1 (B30-104)	L - BR	P shift position switch signal	Ignition switch ON and transfer shift lever not on P	Below 1 V
R (B30-53) - E1 (B30-104)	R - BR	R shift position switch signal	Ignition switch ON and transfer shift lever on R	10 to 14 V
R (B30-53) - E1 (B30-104)	R - BR	R shift position switch signal	Ignition switch ON and transfer shift lever not on R	Below 1 V
N (B30-54) - E1 (B30-104)	Y - BR	N shift position switch signal	Ignition switch ON and transfer shift lever on N	10 to 14 V
N (B30-54) - E1 (B30-104)	Y - BR	N shift position switch signal	Ignition switch ON and transfer shift lever not on N	Below 1 V
D (B30-56) - E1 (B30-104)	B - BR	D shift position switch signal	Ignition switch ON and transfer shift lever on D or 3	10 to 14 V
D (B30-56) - E1 (B30-104)	B - BR	D shift position switch signal	Ignition switch ON and transfer shift lever not on D or 3	Below 1 V

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
3 (A9-26) - E1 (B30-104)	P - BR	3 shift position switch signal	Ignition switch ON and transfer shift lever on 3	10 to 14 V
3 (A9-26) - E1 (B30-104)	P - BR	3 shift position switch signal	Ignition switch ON and transfer shift lever not on 3	Below 1 V
2 (B30-55) - E1 (B30-104)	P - BR	2 shift position switch signal	Ignition switch ON and transfer shift lever on 2 and L	10 to 14 V
2 (B30-55) - E1 (B30-104)	P - BR	2 shift position switch signal	Ignition switch ON and transfer shift lever not on 2 and L	Below 1 V
L (B30-74) - E1 (B30-104)	LG - BR	L shift position switch signal	Ignition switch ON and transfer shift lever on L	10 to 14 V
L (B30-74) - E1 (B30-104)	LG - BR	L shift position switch signal	Ignition switch ON and transfer shift lever not on L	Below 1 V
STP (A9-36) - E1 (B30-104)	L - BR	Stop light switch signal	Brake pedal is depressed	Between 10 V and 14 V
STP (A9-36) - E1 (B30-104)	L - BR	Stop light switch signal	Brake pedal is released	Below 1 V
SL1+ (B30-57) - SL1- (B30-77)	V - P	SL1 solenoid signal	Engine idle speed	Pulse generation (see waveform 1)
SL1+ (B30-57) - SL1- (B30-77)	V - P	SL1 solenoid signal	Ignition switch ON	Pulse generation (see waveform 1)
SL1+ (B30-57) - SL1- (B30-77)	V - P	SL1 solenoid signal	1st gear	Pulse generation (see waveform 1)
SL1+ (B30-57) - SL1- (B30-77)	V - P	SL1 solenoid signal	Not on 1st gear	Below 1 V
SL2+ (B30-58) - SL2- (B30-59)	Y - L	SL2 solenoid signal	Engine idle speed	Pulse generation (see waveform 2)
SL2+ (B30-58) - SL2- (B30-59)	Y - L	SL2 solenoid signal	Ignition switch ON	Pulse generation (see waveform 2)
SL2+ (B30-58) - SL2- (B30-59)	Y - L	SL2 solenoid signal	1st or 2nd gear	Pulse generation (see waveform 2)
SL2+ (B30-58) - SL2- (B30-59)	Y - L	SL2 solenoid signal	3rd or O/D gear	Below 1 V
DSL (B30-79) - E01 (B30-45)	G - BR	DSL solenoid signal	Vehicle speed 65 km/h (40 mph), lock-up (ON to OFF)	Below 1 V
DSL (B30-79) - E01 (B30-45)	G - BR	DSL solenoid signal	Vehicle driving under lock-up position	Pulse generation (see waveform 3)
SLT+ (B30-76) - SLT- (B30-75)	R - GR	SLT solenoid signal	Engine idle speed	Pulse generation (see waveform 4)
S4 (B30-78) - E01 (B30-45)	W - BR	S4 solenoid signal	Ignition switch ON	Below 1 V
S4 (B30-78) - E01 (B30-45)	W - BR	S4 solenoid signal	O/D gear	10 to 14 V
S4 (B30-78) - E01 (B30-45)	W - BR	S4 solenoid signal	Not on O/D gear	Below 1 V
THO1 (B30-72) - ETHO (B30-95)	LG- BR	ATF temperature sensor signal	ATF temperature: 115°C (239°F) or more	Below 1.5 V
NT+ (B30-125) - NT- (B30-124)	W - R	Speed sensor (NT) signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (see waveform 5)
NC+ (B30-101) - NC- (B30-102)	R - W	Speed sensor (NC) signal	Vehicle speed 30 km/h (19 mph): (3rd gear) Engine speed 1,400 rpm	Pulse generation (see waveform 6)



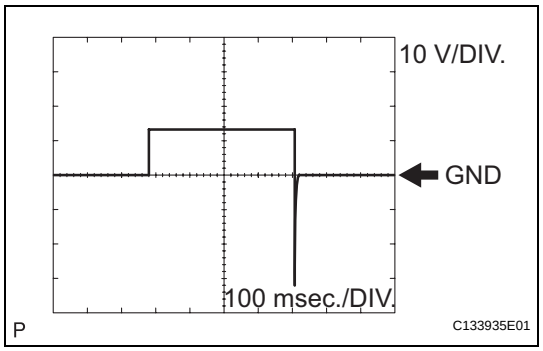
(b) Using an oscilloscope, check the waveform 1.
Waveform 1 (Reference)

Item	Content
Symbols (Terminal No.)	SL1+ (B30-57) - SL1- (B30-77)
Tool Setting	5 V/DIV., 1 msec./DIV.
Condition	Engine idle speed



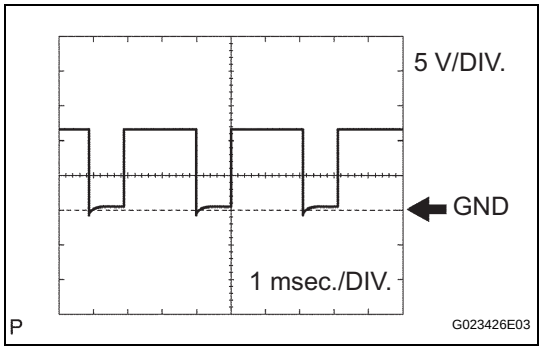
(c) Using an oscilloscope, check the waveform 2.
Waveform 2 (Reference)

Item	Content
Symbols (Terminal No.)	SL2+ (B30-58) - SL2- (B30-59)
Tool Setting	5 V/DIV., 1 msec./DIV.
Condition	Engine idle speed



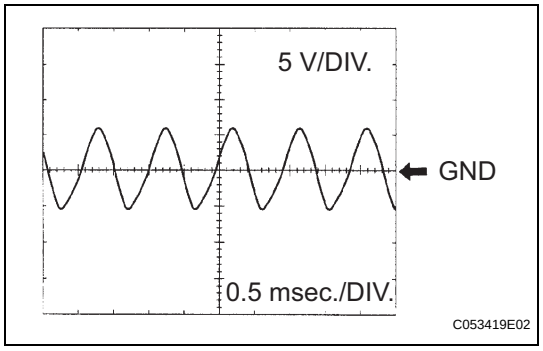
(d) Using an oscilloscope, check the waveform 3.
Waveform 3 (Reference)

Item	Content
Symbols (Terminal No.)	DSL (B30-79) - E01 (B30-45)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Vehicle speed 65 km/h (40 mph), lock-up (ON to OFF)



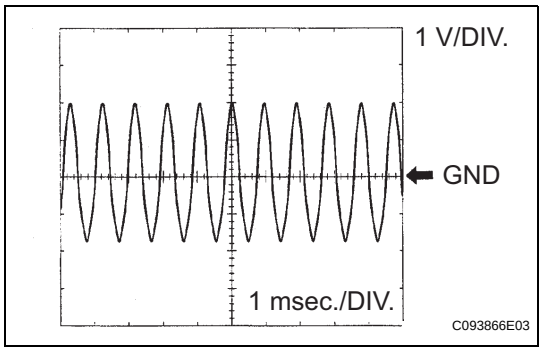
(e) Using an oscilloscope, check the waveform 4.
Waveform 4 (Reference)

Item	Content
Symbols (Terminal No.)	SLT+ (B30-76) - SLT- (B30-75)
Tool Setting	5 V/DIV., 1 msec./DIV.
Condition	Engine idle speed



(f) Using an oscilloscope, check the waveform 5.
Waveform 5 (Reference)

Item	Content
Symbols (Terminal No.)	NT+ (B30-125) - NT- (B30-124)
Tool Setting	5 V/DIV., 0.5 msec./DIV.
Condition	Vehicle speed 20 km/h (12 mph)



(g) Using an oscilloscope, check the waveform 6.
Waveform 6 (Reference)

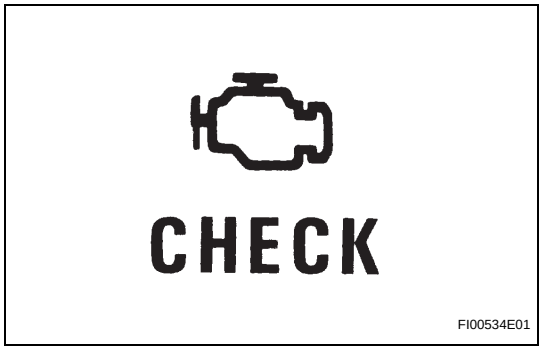
Item	Content
Symbols (Terminal No.)	NC+ (B30-101) - NC- (B30-102)
Tool Setting	1 V/DIV., 1 msec./DIV.
Condition	Vehicle speed 30 km/h (19 mph): (3rd gear) Engine speed 1,400 rpm

AX

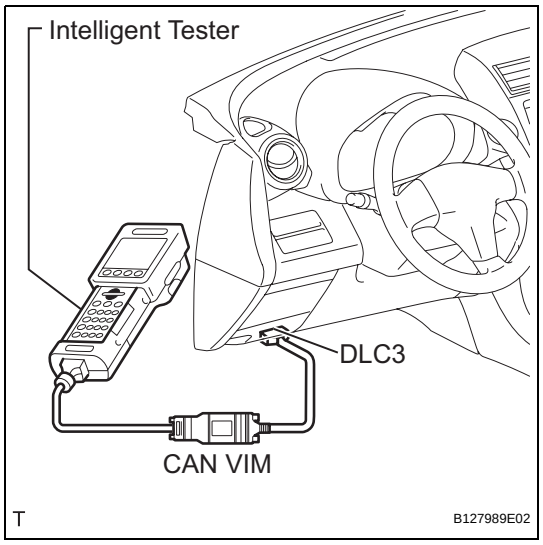
DIAGNOSIS SYSTEM

1. DESCRIPTION

(a) When troubleshooting On-Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the OBD II scan tool (complying with SAE J1987). Various data output from the vehicle's ECM can then be read.



(b) OBD II regulations require that the vehicle's on-board computer illuminates the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in:
(1) The emission control system/components
(2) The powertrain control components (which affect vehicle emissions)
(3) The computer
In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory.
When the malfunction does not reoccur, the MIL stays illuminated until the ignition switch is turned OFF, and the MIL turns OFF when the engine is started. However, the DTCs remain recorded in the ECM memory.



(c) To check DTCs, connect the intelligent tester to the Data Link Connector 3 (DLC3) of the vehicle. The tester displays DTCs, the freeze frame data and a variety of the engine data.
The DTCs and freeze frame data can be erased with the tester (see page AX-29).

2. NORMAL MODE AND CHECK MODE

(a) The diagnosis system operates in "normal mode" during normal vehicle use. In normal mode, "2 trip detection logic" is used to ensure accurate detection of malfunctions. "Check mode" is also available to technicians as an option. In check mode, "1 trip detection logic" is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent malfunctions.

3. 2 TRIP DETECTION LOGIC

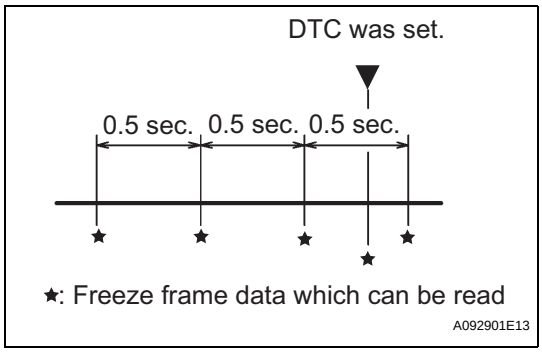
(a) When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the same malfunction is detected during the next drive cycle, the MIL is illuminated (2nd trip).

AX

4. FREEZE FRAME DATA

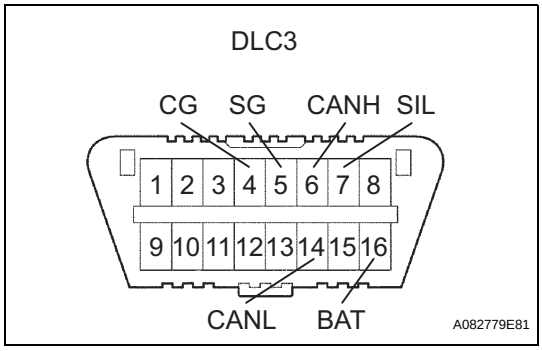
(a) Freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

(b) The intelligent tester records freeze frame data in 5 different instances: 1) 3 times before the DTC is set, 2) once when the DTC is set, and 3) once after the DTC is set. These data can be used to simulate the vehicle's condition around the time when the malfunction occurred. The data may help find the cause of the malfunction, or judge if the DTC is being caused by a temporary malfunction or not.



5. DATA LINK CONNECTOR 3 (DLC3)

(a) The vehicle's ECM uses the ISO 15765-4 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 15765-4 format.



Symbols (Terminal No.)	Terminal Description	Condition	Specified Condition
SIL (7) - SG (5)	Bus "+" line	During transmission	Pulse generation
CG (4) - Body ground	Chassis ground	Always	Below 1 Ω
SG (5) - Body ground	Signal ground	Always	Below 1 Ω
BAT (16) - Body ground	Battery positive	Always	9 to 14 V
CANH (6) - CANL (14)	HIGH-level CAN bus line	Ignition switch OFF	54 to 69 Ω
CANH (6) - Battery positive	HIGH-level CAN bus line	Ignition switch OFF	1 MΩ or higher
CANH (6) - CG (4)	HIGH-level CAN bus line	Ignition switch OFF	200 Ω or higher
CANL (14) - Battery positive	LOW-level CAN bus line	Ignition switch OFF	1 MΩ or higher
CANL (14) - CG (4)	LOW-level CAN bus line	Ignition switch OFF	200 Ω or higher

HINT:
*: Before measuring the resistance, leave the vehicle as is for at least 1 minute and do not operate the ignition switch, other switches or doors.
If the result is not as specified, the DLC3 may have a malfunction. Repair or replace the harness and connector.
HINT:
Connect the cable of the intelligent tester to the DLC3, turn the ignition switch ON and attempt to use the tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

If communication is normal when the tester is connected to another vehicle, inspect the DLC3 on the original vehicle.
If communication is still not possible when the tester is connected to another vehicle, the problem is probably in the tester itself. Consult the Service Department listed in the tester's instruction manual.

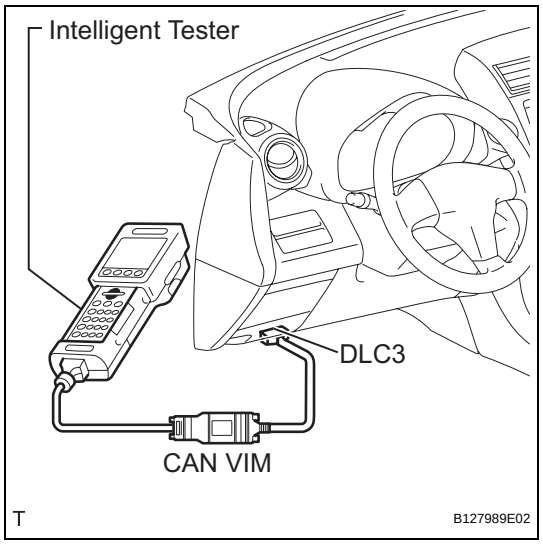
6. CHECK MIL

(a) Check that the MIL illuminates when turning the ignition switch ON.
If the MIL does not illuminate, there is a problem in the MIL circuit (see page ES-386).

(b) When the engine is started, the MIL should turn off.

7. ALL READINESS

(a) For this vehicle, using the intelligent tester allows readiness codes corresponding to all DTCs to be read. When the diagnosis (normal or malfunctioning) has been completed, readiness codes are set. Enter the following menus: ENHANCED OBD II / MONITOR STATUS.



DTC CHECK / CLEAR

1. CHECK DTC

(a) DTCs which are stored in the ECM can be displayed with the intelligent tester.
The intelligent tester can display pending DTCs and current DTCs. Some DTCs are not stored unless a malfunction is detected in consecutive driving cycles. When a malfunction is detected in only one driving cycle, it is stored as a pending DTC.

(1) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(2) Turn the ignition switch ON and turn the tester ON.

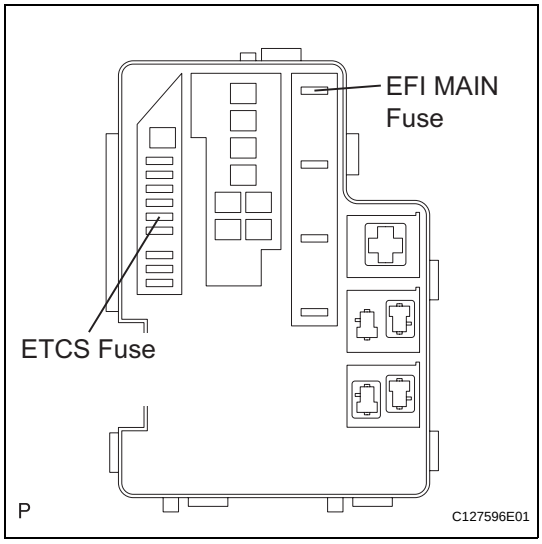
(3) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES (or PENDING CODE).

(4) Confirm the DTCs and freeze frame data and then write them down.

(5) Confirm the details of the DTCs (see page AX-35).

NOTICE:
When simulating a symptom with the scan tool to check for DTCs, use normal mode. For codes on the DIAGNOSTIC TROUBLE CODE CHART subject to "2 trip detection logic", perform the following actions.
Turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again. When the symptom has been simulated twice, the MIL illuminates and the DTCs are recorded in the ECM.

AX



2. CLEAR DTC

(a) When using the intelligent tester:

(1) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(2) Turn the ignition switch ON and turn the tester ON.

(3) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODES. Then and press YES.
HINT:
When operating the tester to erase the codes, the DTCs and freeze frame data will be erased.

(b) When not using the intelligent tester:

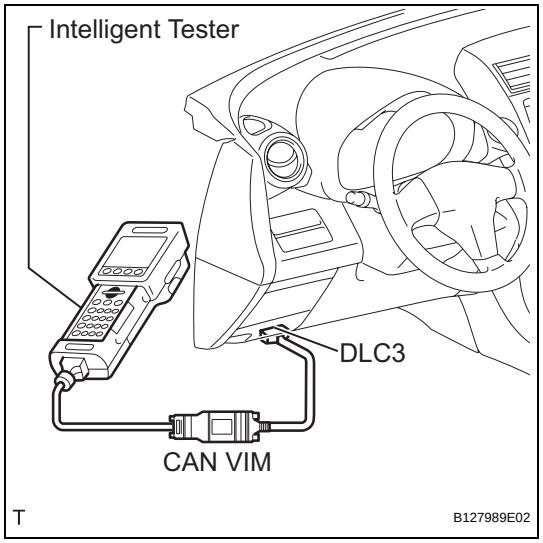
(1) Disconnect the battery terminal or remove the EFI MAIN and ETCS fuses from the engine room No. 1 relay block and engine room No. 1 junction block for 60 seconds or more. However, if you disconnect the battery terminal, perform the "INITIALIZATION" procedure (see page AX-18).

CHECK MODE PROCEDURE

1. DESCRIPTION

(a) Check mode has a higher sensitivity to malfunctions and can detect malfunctions that normal mode cannot detect. Check mode can also detect all the malfunctions that normal mode can detect. In check mode, DTCs are detected with 1 trip detection logic.

2. CHECK MODE PROCEDURE



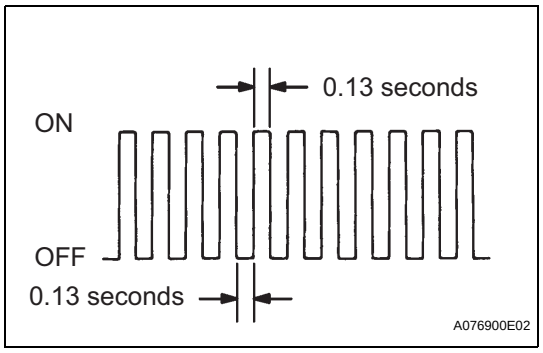
(a) Make sure that the following conditions below are met:
  (1) Battery positive voltage 11 V or more
  (2) Throttle valve fully closed
  (3) Transaxle in the P or N position
  (4) A/C OFF

(b) Turn the ignition switch OFF.

(c) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(d) Turn the ignition switch ON and turn the tester ON.

(e) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / CHECK MODE.



(f) Change the ECM to check mode. Make sure the MIL flashes as shown in the illustration.

NOTICE:

All DTCs and freeze frame data recorded will be erased if: 1) the intelligent tester is used to change the ECM from normal mode to check mode or vice versa; or 2) during check mode, the ignition switch is turned from ON to ACC or OFF.

Before check mode, make notes of the DTCs and freeze frame data.

(g) Start the engine. The MIL should turn off after the engine starts.

(h) Perform "MONITOR DRIVE PATTERN" for the ECT test (see page AX-19).
(Or, simulate the conditions of the malfunction described by the customer.)

(i) After simulating the malfunction conditions, use the tester to check the DTC and freeze frame data.

AX

FAIL-SAFE CHART

1. FAIL-SAFE CHART

This function minimizes the loss of the ECT functions when a malfunction occurs in a sensor or solenoid.

(a) Automatic Transmission Fluid (ATF) temperature sensor:
When the ATF temperature sensor has a malfunction, O/D up-shift is prohibited.

(b) Counter gear speed sensor NC (Speed sensor NC):
When the counter gear speed sensor has a malfunction, O/D up-shift is prohibited.

(c) Shift solenoid valve DSL:
When the solenoid valve DSL has a malfunction, the current to the solenoid valve is stopped.
This stops lock-up control, then fuel economy decreases.

(d) Shift solenoid valve SL1, SL2 and S4:
If any of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid "ON" and "OFF" in order to shift into the gear positions shown in the table below.
Manual shifting as shown in the following table must be done. In case of a short circuit, the ECM stops sending the current to the short circuited solenoid.
Even if starting the engine in the fail-safe mode, the gear position remains in the same position.

Normal				**Shift Solenoid Valve SL1**				**Shift Solenoid Valve SL2**				**Shift Solenoid Valve S4**			
Gear	**Solenoid Valve**			**Gear**	**Solenoid Valve**			**Gear**	**Solenoid Valve**			**Gear**	**Solenoid Valve**		
	SL1	**SL2**	**S4**		**SL1**	**SL2**	**S4**		**SL1**	**SL2**	**S4**		**SL1**	**SL2**	**S4**
1st	ON	ON	OFF	2nd	X	ON	OFF	3rd	ON ↓ OFF	X	OFF	1st	ON	ON	X
2nd	OFF	ON	OFF	2nd	X	ON	OFF	3rd	OFF	X	OFF	2nd	OFF	ON	X
3rd	OFF	OFF	OFF	3rd	X	OFF ↓ ON	OFF ↓ ON	3rd	OFF	X	OFF	3rd	OFF	OFF	X
O/D	OFF	OFF	ON	3rd	X	OFF ↓ ON	ON	O/D	OFF	X	ON	3rd	OFF	OFF	X

Shift Solenoid Valve SL1 and SL2				**Shift Solenoid Valve SL1 and S4**				**Shift Solenoid Valve SL2 and S4**				**Shift Solenoid Valve SL1, SL2 and S4**			
Gear	**Solenoid Valve**			**Gear**	**Solenoid Valve**			**Gear**	**Solenoid Valve**			**Gear**	**Solenoid Valve**		
	SL1	**SL2**	**S4**		**SL1**	**SL2**	**S4**		**SL1**	**SL2**	**S4**		**SL1**	**SL2**	**S4**
3rd	X	X	OFF	2nd	X	ON	X	3rd	ON ↓ OFF	X	X	3rd	X	X	X
3rd	X	X	OFF	2nd	X	ON	X	3rd	OFF	X	X	3rd	X	X	X
3rd	X	X	OFF	2nd	X	OFF ↓ ON	X	3rd	OFF	X	X	3rd	X	X	X
O/D	X	X	ON	2nd	X	OFF ↓ ON	X	3rd	OFF	X	X	3rd	X	X	X

HINT:

- ↓: Condition in the normal operation is shown above the "↓".
- ↓: Condition in the fail-safe mode is shown beneath the "↓".
- E/B: Engine brake.

DATA LIST / ACTIVE TEST

1. READ DATA LIST

HINT:

Using the intelligent tester's DATA LIST allows switch, sensor, actuator, and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

(a) Warm up the engine.

(b) Turn the ignition switch OFF.

(c) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(d) Turn the ignition switch ON and turn the tester ON.

(e) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.

(f) Follow the instructions on the tester and read the DATA LIST.

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
SPD (NC)	Counter gear speed/ Min.: 0 rpm Max.: 12,750 rpm	4th (O/D) when shift lever is on D (after warming up the engine); Intermediate shaft speed (NC) becomes close to the engine speed	Data is displayed in increments of 50 rpm
SPD (NT)	Input turbine speed/ Min.: 0 rpm Max.: 12,750 rpm	• Lock-up ON (after warming up engine): Input turbine speed (NT) equal to engine speed. • Lock-up OFF (idling with shift lever on N): Input turbine speed (NT) is nearly equal to engine speed.	Data is displayed in increments of 50 rpm
PNP SW (NSW)	PNP switch status/ ON or OFF	Shift lever is: On P or N: ON Not on P or N: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, see page AX-39
STOP LIGHT SW	Stop light switch status/ ON or OFF	• Brake pedal is depressed: ON • Brake pedal is released: OFF	-
SHIFT	ECM gear shift command/ 1st, 2nd, 3rd or 4th	Shift lever position is: • On L: 1st • On 2: 1st or 2nd • On 3: 1st, 2nd or 3rd • On D: 1st, 2nd, 3rd or 4th	-

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
REVERSE	PNP switch status/ ON or OFF	Shift lever is: On R: ON Not on R: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, see page AX-39
PARKING	PNP switch status/ ON or OFF	Shift lever is: On P: ON Not on P: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, see page AX-39
NEUTRAL	PNP switch status/ ON or OFF	Shift lever is: On N: ON Not on N: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, see page AX-39
DRIVE	PNP switch status/ ON or OFF	Shift lever is: On D: ON Not on D: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, see page AX-39
3RD	PNP switch status/ ON or OFF	Shift lever is: On 3: ON Not on 3: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, see page AX-39
2ND	PNP switch status/ ON or OFF	Shift lever is: On 2: ON Not on 2: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, see page AX-39
LOW	PNP switch status/ ON or OFF	Shift lever is: On L: ON Not on L: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, see page AX-39

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
A/T OIL TEMP1	ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 215°C (419°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If value is -40°C (-40°F) or "150°C (302°F) or more", ATF temperature sensor circuit is open or short circuited
LOCK UP SOL	Lock-up solenoid status/ ON or OFF	• Lock-up: ON • Not on lock-up: OFF	-
SOLENOID (SLT)	Shift solenoid SLT status/ ON or OFF	• Accelerator pedal is depressed: OFF • Accelerator pedal is released: ON	-

AX

2. PERFORM ACTIVE TEST

HINT:

Performing the intelligent tester's ACTIVE TEST allows relay, VSV, actuator and other items to be operated without removing any parts. Performing the ACTIVE TEST early in troubleshooting is one way to save time. The DATA LIST can be displayed during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
(d) Turn the ignition switch ON and turn the tester ON.
(e) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
(f) Perform the ACTIVE TEST.

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate shift solenoid valve and set each shift lever position by yourself [Vehicle Condition] • IDL: ON • 50 km/h (31 mph) or less [Other information] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of shift solenoid valves
SOLENOID (S4)	[Test Details] Operate the shift solenoid S4 [Vehicle Condition] • Vehicle stopped • Shift lever P or N position	-
SOLENOID (SL1)	[Test Details] Operate the shift solenoid SL1 [Vehicle Condition] • Vehicle stopped • Shift lever P or N position	-
SOLENOID (SL2)	[Test Details] Operate the shift solenoid SL2 [Vehicle Condition] • Vehicle stopped • Shift lever P or N position	-
LOCK UP	[Test Details] Control shift solenoid DSL to set automatic transaxle to the lock-up condition [Vehicle Condition] • Throttle valve opening angle: Less than 35% • Vehicle speed: 60 km/h (36 mph) or more	Possible to check shift solenoid valve DSL operation

Item	Test Details	Diagnostic Note
SOLENOID (DSL)	[Test Details] Operate the shift solenoid DSL [Vehicle Condition] • Vehicle stopped • Shift lever P or N position	-
SOLENOID (SLT)*	[Test Details] Operate shift solenoid SLT and raise line pressure [Vehicle Condition] • Vehicle stopped • IDL: ON HINT: OFF: Line pressure up (when Active Test "SOLENOID (SLT)" is performed, ECM commands SLT solenoid to turn OFF) ON: No action (normal operation)	-

HINT:
*: "SOLENOID (SLT)" in the ACTIVE TEST is performed to check the line pressure changes by connecting SST to the automatic transaxle, which is used in the HYDRAULIC TEST (see page AX-16) as well. Please note that the pressure values in the ACTIVE TEST and HYDRAULIC TEST are different.

AX

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed in the table below and proceed to the page given.
HINT:

- *1: "Comes on" means the Malfunction Indicator Lamp (MIL) illuminates.
- *2: "DTC stored" means the ECM memorizes the malfunction code if the ECM detects the DTC detection condition.
- These DTCs may be output when the clutch, brake, gear components, etc., inside the automatic transaxle are damaged.

DTC No.	Detection Item	Trouble Area	MIL*1	Memory*2	See page
P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	- Open or short in park/neutral position switch circuit - Park/Neutral position switch - ECM	Comes on	DTC stored	AX-39
P0710	Transmission Fluid Temperature Sensor "A" Circuit	- Open or short in ATF temperature sensor circuit - ATF temperature sensor - ECM	Comes on	DTC stored	AX-46
P0711	Transmission Fluid Temperature Sensor "A" Performance	- Open or short in No. 1 ATF temperature sensor circuit - No. 1 ATF temperature sensor - ECM	Comes on	DTC stored	AX-50
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	- Short in ATF temperature sensor circuit - ATF temperature sensor - ECM	Comes on	DTC stored	AX-46
P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	- Open in ATF temperature sensor circuit - ATF temperature sensor - ECM	Comes on	DTC stored	AX-46
P0717	Input Speed Sensor Circuit No Signal	- Open or short in speed sensor NT circuit - Speed sensor NT - ECM	Comes on	DTC stored	AX-53
P0724	Brake Switch "B" Circuit High	- Short in stop light switch circuit - Stop light switch - ECM	Comes on	DTC stored	AX-57

DTC No.	Detection Item	Trouble Area	MIL*1	Memory*2	See page
P0741	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve DSL)	- Shift solenoid valve DSL remains open or closed - Valve body is blocked - Shift solenoid valve DSL - Torque converter clutch - Automatic transaxle (clutch, brake, gear, etc.) - Line pressure is too low - ECM	Comes on	DTC stored	AX-60
P0746	Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)	- Shift solenoid valve SL1 remains open or closed - Valve body is blocked - Shift solenoid valve SL1 - Automatic transaxle (clutch, brake, gear, etc.) - ECM	Comes on	DTC stored	AX-66
P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	- Open or short in shift solenoid valve SL1 circuit - Shift solenoid valve SL1 - ECM	Comes on	DTC stored	AX-70
P0766	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	- Shift solenoid valve S4 remains open or closed - Valve body is blocked - Shift solenoid valve S4 - Automatic transaxle (clutch, brake, gear, etc.) - ECM	Comes on	DTC stored	AX-73
P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	- Shift solenoid valve SL2 remains open or closed - Valve body is blocked - Shift solenoid valve SL2 - Automatic transaxle (clutch, brake, gear, etc.) - ECM	Comes on	DTC stored	AX-77
P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	- Open or short in shift solenoid valve SL2 circuit - Shift solenoid valve SL2 - ECM	Comes on	DTC stored	AX-81
P0793	Intermediate Shaft Speed Sensor "A"	- Open or short in speed sensor NC circuit - Speed sensor NC - ECM	Comes on	DTC stored	AX-84

DTC No.	Detection Item	Trouble Area	MIL*1	Memory*2	See page
P0982	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)	- Short in shift solenoid valve S4 circuit - Shift solenoid valve S4 - ECM	Comes on	DTC stored	AX-88
P0983	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)	- Open in shift solenoid valve S4 circuit - Shift solenoid valve S4 - ECM	Comes on	DTC stored	AX-88
P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	- Shift solenoid valve SLT remains open or closed - Valve body is blocked - Torque converter clutch - Automatic transaxle (clutch, brake, gear, etc.) - ECM	Comes on	DTC stored	AX-91
P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	- Open or short in shift solenoid valve SLT circuit - Shift solenoid valve SLT - ECM	Comes on	DTC stored	AX-96
P2769	Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL)	- Short in shift solenoid valve DSL circuit - Shift solenoid valve DSL - ECM	Comes on	DTC stored	AX-99
P2770	Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve DSL)	- Open in shift solenoid valve DSL circuit - Shift solenoid valve DSL - ECM	Comes on	DTC stored	AX-99

DTC	P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)

DESCRIPTION

The Park/Neutral Position (PNP) switch detects the shift lever position and sends signals to the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P0705	When one of following conditions is met: (A) Any 2 or more of the following signals are ON simultaneously (2 trip detection logic) • P input signal is ON • N input signal is ON • R input signal is ON • D input signal is ON • 2 input signal is ON • L input signal is ON (B) Any 2 or more of the following signals are ON simultaneously (2 trip detection logic) • NSW input signal is ON • R input signal is ON • D input signal is ON • 2 input signal is ON • L input signal is ON (C) All of the signals are OFF simultaneously (2 trip detection logic) • P input signal is OFF • N input signal is OFF • NSW input signal is OFF • R input signal is OFF • D input signal is OFF • 2 input signal is OFF • L input signal is OFF (D) Both 1 and 2 are met (2 trip detection logic) 1. Either of the following is met (a) NSW input signal is ON (b) P input signal is ON (c) N input signal is ON (d) R input signal is ON 2. Either of the following is met (a) 3 input signal is ON (b) L input signal is ON	• Open or short in park/neutral position switch circuit • Park/Neutral position switch • ECM

AX

MONITOR DESCRIPTION

These DTCs indicate a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.
The park/neutral position switch detects the shift lever position and sends a signal to the ECM.
For security, the park/neutral position switch detects the shift lever position so that the engine can be started only when the shift lever is on P or N.
The park/neutral position switch sends a signal to the ECM according to the shift lever position (R, D, 3, 2 or L).
The ECM determines that there is a problem with the switch or related parts if it receives more than 1 position signal simultaneously. The ECM will illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P0705: Park/Neutral position switch/Verify switch input
Required sensors/Components	Park/Neutral position switch
Frequency of operation	Continuous
Duration	2 seconds or 60 seconds
MIL operation	2 driving cycles

Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Ignition switch	ON
Battery voltage	10.5 V or more

AX

TYPICAL MALFUNCTION THRESHOLDS

Condition (A)

Number of the following signal input at the same time	2 or more
P switch	ON
N switch	ON
R switch	ON
D switch	ON
2 switch	ON
L switch	ON

Condition (B)

Number of the following signal input at the same time	2 or more
NSW switch	ON
R switch	ON
D switch	ON
2 switch	ON
L switch	ON

Condition (C)

When all of the following conditions are met	-
P switch	OFF
N switch	OFF
NSW switch	OFF
R switch	OFF
D switch	OFF
2 switch	OFF
L switch	OFF

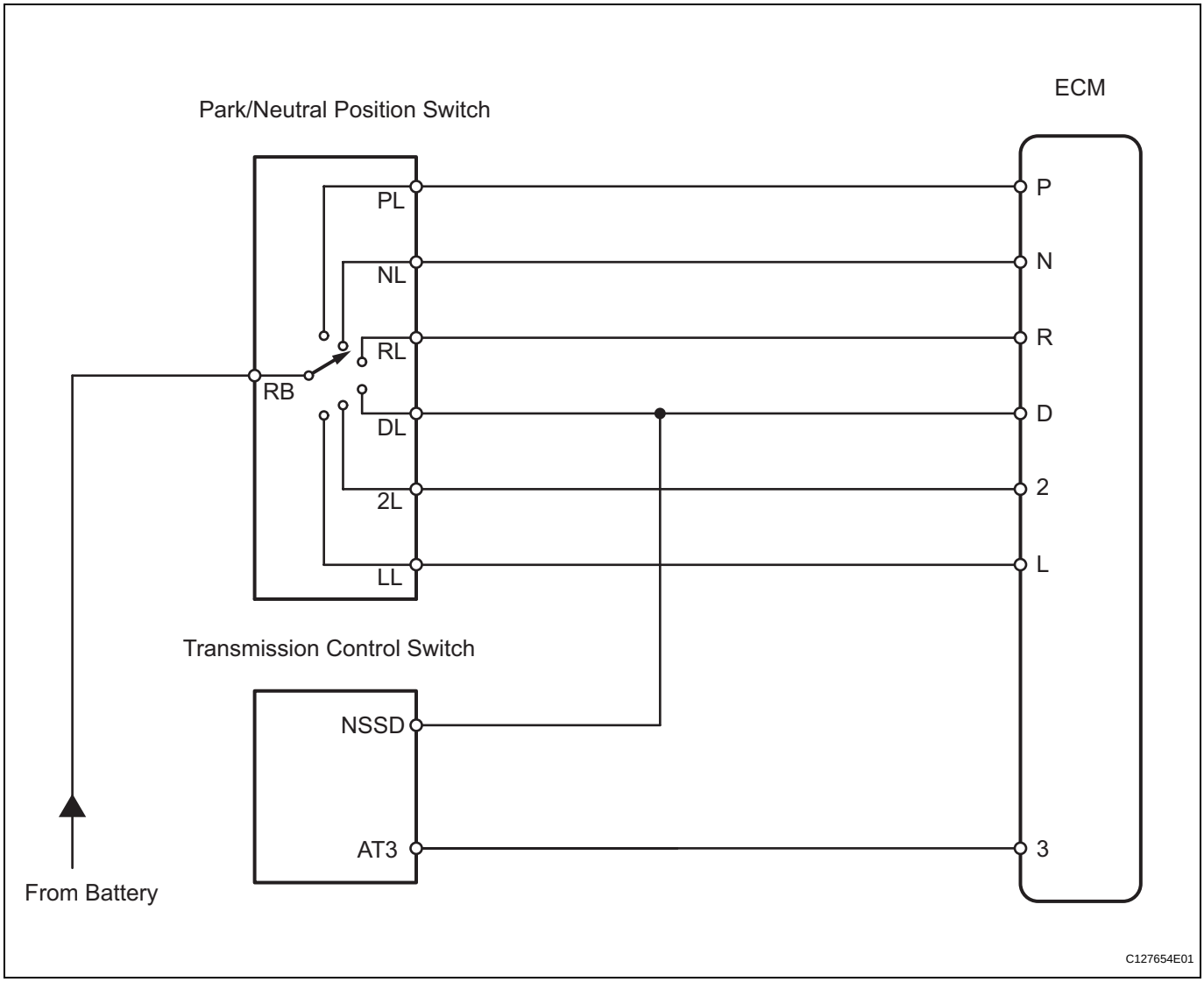
Condition (D)

When both conditions (a) and (b) are met	-
(a) When one of following condition is met	-
NSW switch	ON
P switch	ON
N switch	ON
R switch	ON
(b) When one of following condition is met	-
3 switch	ON
L switch	ON

COMPONENT OPERATING RANGE

Park/Neutral position switch	Park/Neutral position switch sends only one signal to ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

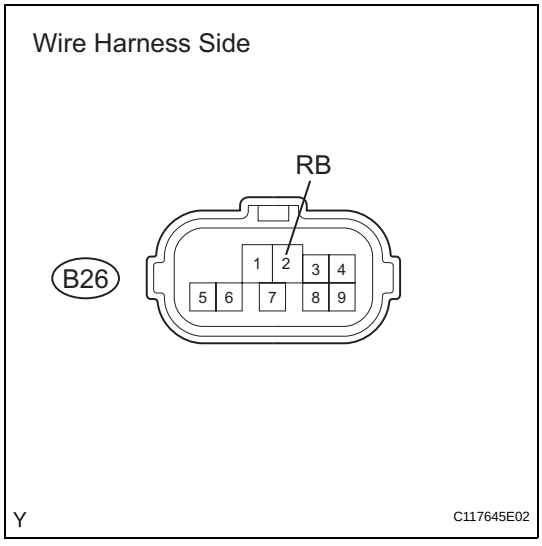
1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
6. Follow the instructions on the tester and read the DATA LIST.

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
PNP SW (NSW)	PNP switch status/ ON or OFF	Shift lever is: On P or N: ON Not on P or N: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
REVERSE	PNP switch status/ ON or OFF	Shift lever is: On R: ON Not on R: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect
PARKING	PNP switch status/ ON or OFF	Shift lever is: On P: ON Not on P: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect
NEUTRAL	PNP switch status/ ON or OFF	Shift lever is: On N: ON Not on N: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect
DRIVE	PNP switch status/ ON or OFF	Shift lever is: On D: ON Not on D: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect
3RD	PNP switch status/ ON or OFF	Shift lever is: On 3: ON Not on 3: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect
2ND	PNP switch status/ ON or OFF	Shift lever is: On 2: ON Not on 2: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect
LOW	PNP switch status/ ON or OFF	Shift lever is: On L: ON Not on L: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect

AX

1 CHECK WIRE HARNESS (PARK/NEUTRAL POSITION SWITCH - BATTERY)



(a) Disconnect the B26 park/neutral position switch connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage.

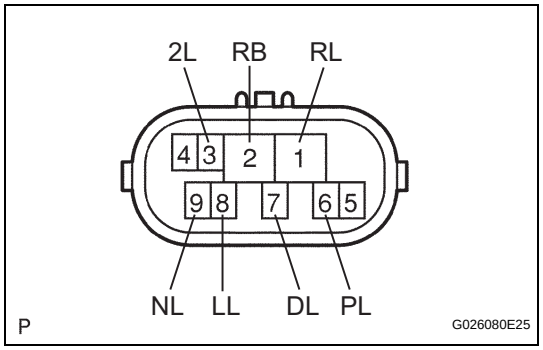
Standard voltage

Tester Connection	Specified Condition
2 (RB) - Body ground	10 to 14 V

NG → **CHECK POWER SOURCE OF ECM**

OK

2 INSPECT PARK/NEUTRAL POSITION SWITCH



(a) Disconnect the B26 park/neutral position switch connector.
(b) Measure the resistance of the park/neutral position switch when the shift lever is moved to each position.

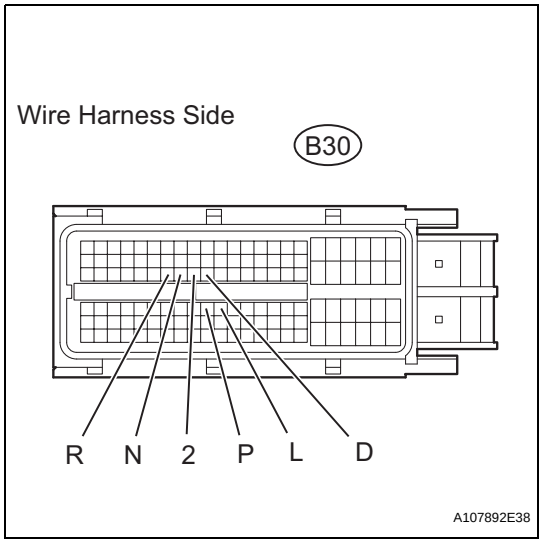
Standard resistance

Tester Connection	Shift Lever Position	Specified Condition
6 (PL) - 2 (RB)	P	Below 1 Ω
6 (PL) - 2 (RB)	Not on P	10 kΩ or higher
1 (RL) - 2 (RB)	R	Below 1 Ω
1 (RL) - 2 (RB)	Not on R	10 kΩ or higher
9 (NL) - 2 (RB)	N	Below 1 Ω
9 (NL) - 2 (RB)	Not on N	10 kΩ or higher
7 (DL) - 2 (RB)	D	Below 1 Ω
7 (DL) - 2 (RB)	Not on D	10 kΩ or higher
3 (2L) - 2 (RB)	2	Below 1 Ω
3 (2L) - 2 (RB)	Not on 2	10 kΩ or higher
8 (LL) - 2 (RB)	L	Below 1 Ω
8 (LL) - 2 (RB)	Not on L	10 kΩ or higher

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH**

OK

3 CHECK WIRE HARNESS (ECM - BATTERY AND BODY GROUND)



(a) Disconnect the B30 ECM connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage of the wire harness side connector.

Standard voltage

Tester Connection	Shift Lever Position	Specified Condition
B30-73 (P) - Body ground	P	10 to 14 V
B30-73 (P) - Body ground	Not on P	Below 1 V
B30-53 (R) - Body ground	R	10 to 14 V*
B30-53 (R) - Body ground	Not on R	Below 1 V
B30-54 (N) - Body ground	N	10 to 14 V
B30-54 (N) - Body ground	Not on N	Below 1 V
B30-56 (D) - Body ground	D or 3	10 to 14 V
B30-56 (D) - Body ground	Not on D or 3	Below 1 V
B30-55 (2) - Body ground	2	10 to 14 V

Tester Connection	Shift Lever Position	Specified Condition
B30-55 (2) - Body ground	Not on 2	Below 1 V
B30-74 (L) - Body ground	L	10 to 14 V
B30-74 (L) - Body ground	Not on L	Below 1 V

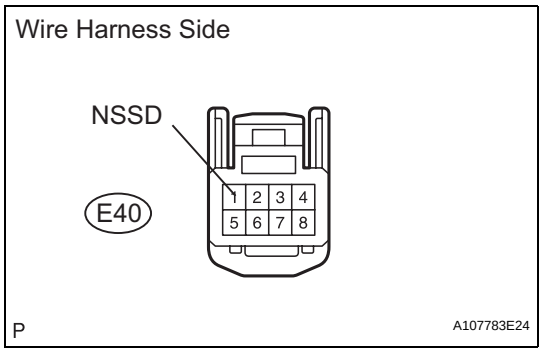
AX

HINT:
*: The voltage will drop slightly due to the illumination of the back-up light.

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

4 CHECK WIRE HARNESS (PARK/NEUTRAL POSITION SWITCH - TRANSMISSION CONTROL SWITCH)



(a) Disconnect the E40 switch connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage when the shift lever is moved to each position.

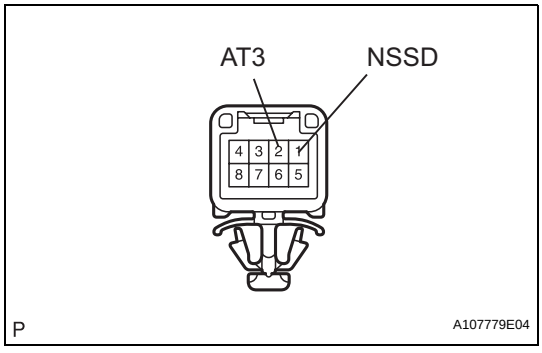
Standard voltage

Tester Connection	Shift Lever Position	Specified Condition
1 (NSSD) - Body ground	D and 3	10 to 14 V
1 (NSSD) - Body ground	Not on D and 3	Below 1 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

5 INSPECT TRANSMISSION CONTROL SWITCH



(a) Disconnect the E40 switch connector.
(b) Measure the resistance of the switch when the shift lever is moved to each position.

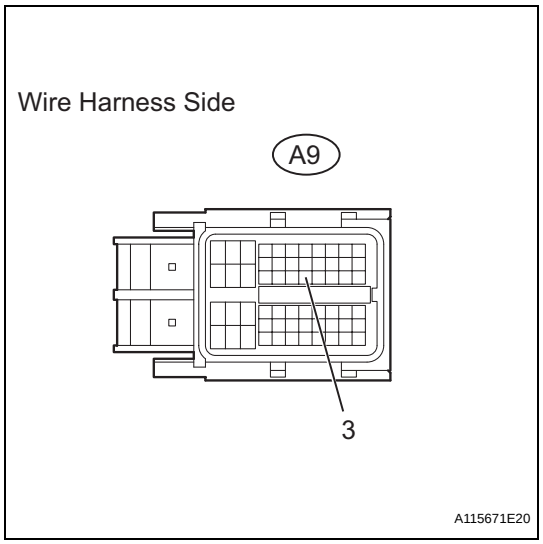
Standard resistance

Tester Connection	Shift Lever Position	Specified Condition
1 (NSSD) - 2 (AT3)	D	10 kΩ or higher
1 (NSSD) - 2 (AT3)	3	Below 1 Ω

NG → **REPLACE TRANSMISSION CONTROL SWITCH**

OK

6	CHECK WIRE HARNESS (TRANSMISSION CONTROL SWITCH - BATTERY AND BODY GROUND)



(a) Disconnect the A9 ECM connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage of the wire harness side connector.

Standard voltage

Tester Connection	Shift Lever Position	Specified Condition
A9-26 (3) - Body ground	3	10 to 14 V
A9-26 (3) - Body ground	Not on 3	Below 1 V

HINT:
*: The voltage will drop slightly due to the illumination of the back-up light.

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

AX

DTC	P0710	Transmission Fluid Temperature Sensor "A" Circuit

DTC	P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input

AX

DTC	P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor converts the ATF temperature into a resistance value which is input into the ECM.
The ECM applies a voltage to the temperature sensor through ECM terminal THO1.
The sensor resistance changes with the ATF temperature.
One terminal of the sensor is grounded so that the sensor resistance and voltage decrease as the temperature becomes higher.
The ECM calculates the ATF based on the voltage signal.

DTC No.	DTC Detection Condition	Trouble Area
P0710	ATF temperature sensor resistance changes from (a) to (b) or from (b) to (a) in less than 0.5 sec., and P0712 and P0713 are not detected (1 trip detection logic): (a) ATF temperature sensor resistance is less than 79 Ω (b) ATF temperature sensor resistance is more than 156 kΩ	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM
P0712	ATF temperature sensor resistance is less than 79 Ω for 0.5 sec. or more (1 trip detection logic)	• Short in ATF temperature sensor circuit • ATF temperature sensor • ECM
P0713	15 minutes or more after the engine start, ATF temperature sensor resistance is more than 156 kΩ for 0.5 sec. or more (1 trip detection logic)	• Open in ATF temperature sensor circuit • ATF temperature sensor • ECM

MONITOR DESCRIPTION

ATF temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 79 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will illuminate the MIL and store the DTC.
HINT:

- *1: 150°C (302°F) or more is indicated regardless of the actual ATF temperature.
- *2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.
- The ATF temperature can be checked on the intelligent tester display.

MONITOR STRATEGY

Related DTCs	P0710: ATF temperature sensor/Range check (Chattering) P0712: ATF temperature sensor/Range check (Low resistance) P0713: ATF temperature sensor/Range check (High resistance)
Required sensors/Components	ATF temperature sensor
Frequency of operation	Continuous
Duration	0.5 sec.

MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0710, P0712: Range check (Chattering, Low resistance)

The monitor will run whenever the following DTCs are not present.	None
The typical enabling condition is not available.	-

P0713: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	None
Time after engine start	15 min. or more

TYPICAL MALFUNCTION THRESHOLDS

P0710: Range check (Chattering)

ATF temperature sensor resistance	Less than 79 Ω or more than 156 kΩ

P0712: Range check (Low resistance)

ATF temperature sensor resistance	Less than 79 Ω

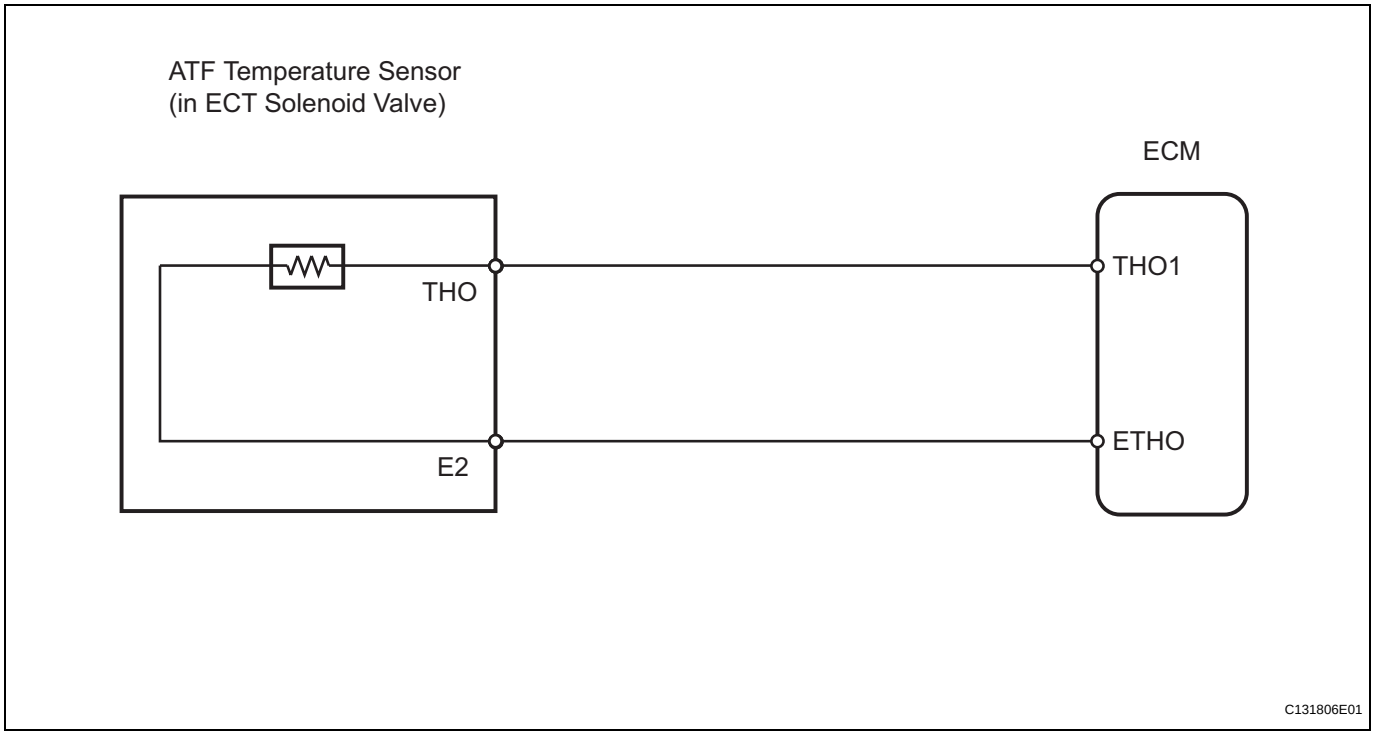
P0713: Range check (High resistance)

ATF temperature sensor resistance	More than 156 kΩ

COMPONENT OPERATING RANGE

ATF temperature sensor	79 Ω to 156 kΩ

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.
NOTICE:
In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

AX

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
6. Follow the instructions on the tester and read the DATA LIST.

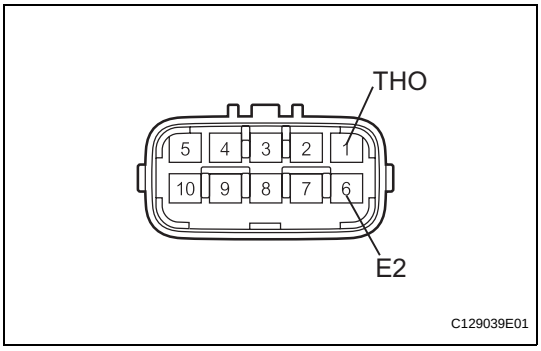
Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
A/T OIL TEMP1	ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 215°C (419°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If value is -40°C (-40°F) or "150°C (302°F) or more", ATF temperature sensor circuit is open or short circuited

HINT:
- When DTC P0712 is output and the tester output is 150°C (302°F) or more, there is a short circuit.
- When DTC P0713 is output and the tester output is -40°C (-40°F), there is an open circuit. Measure the resistance between terminal THO1 (THO) and the body ground.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

HINT:
If a circuit related to the ATF temperature sensor becomes open, P0713 is set in approximately 0.5 seconds. It is not necessary to inspect the circuit when P0711 is set.

1	INSPECT TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)



(a) Disconnect the B27 wire connector.
(b) Measure the resistance of the transmission wire.
Standard resistance

Tester Connection	Specified Condition
1 (THO) - 6 (E2)	90 Ω to 156 kΩ
1 (THO) - Body ground	1 MΩ or higher
6 (E2) - Body ground	1 MΩ or higher

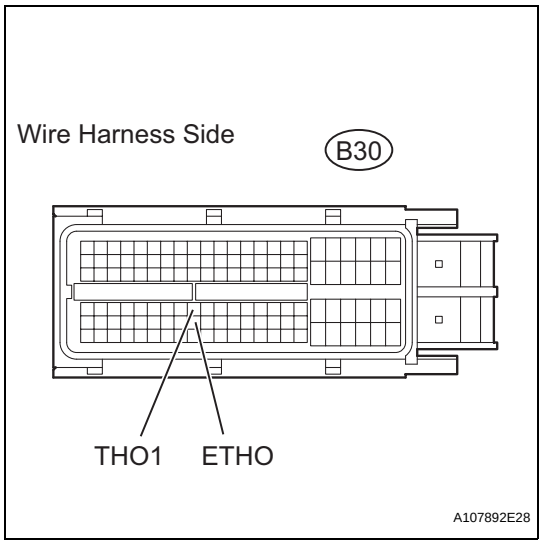
HINT:
If the resistance is out of the specified range of either of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.
Standard resistance

ATF Temperature	Specified Condition
10°C (68°F)	6.4 kΩ
110°C (230°F)	0.2 kΩ

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2	CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)



(a) Disconnect the B30 ECM connector.
(b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Specified Condition
B30-72 (THO1) - B30-95 (ETHO)	90 Ω to 156 kΩ
B30-72 (THO1) - Body ground	1 MΩ or higher
B30-95 (ETHO) - Body ground	1 MΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

AX

DTC	P0711	Transmission Fluid Temperature Sensor "A" Performance

DESCRIPTION

Refer to DTC P0710 (see page AX-46).

DTC No.	DTC Detection Condition	Trouble Area
P0711	Case 1 (2 trip detection logic): First, ECM checks for following conditions: (a) 17 minutes or more after engine is started and after 9 km (5.6 miles) or more of driving, ECT is -15°C (5°F) or more (b) After starting engine and certain period of time has elapsed, ECT and IAT are -10°C (14°F) or more If conditions are met, ECM then checks if ATF temperature is less than 20°C (68°F). If so, ECM interprets this as fault and illuminates MIL. Case 2 (2 trip detection logic): First, ECM checks for following conditions: (a) ECT is 60°C (140°F) or more (b) After starting engine and certain period of time has elapsed, ECT is less than 35°C (95°F) If conditions are met, ECM then checks if ATF temperature is 100°C (212°F) or more. If so, ECM interprets this as fault and illuminates MIL.	• Open or short in No. 1 ATF temperature sensor circuit • No. 1 ATF temperature sensor • ECM

MONITOR DESCRIPTION

This DTC indicates that there is a problem with output from the ATF temperature sensor and that the sensor itself is defective. The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, detects open or short circuits of the ATF temperature circuit, and detects faults in the ATF temperature sensor.
Case 1 (2 trip detection logic):
First, the ECM checks for the following conditions:
(a) 17 minutes or more after the engine is started and after 9 km (5.6 miles) or more of driving, the ECT is -15°C (5°F) or more.
(b) After starting the engine and a certain period of time has elapsed, the ECT and IAT are -10°C (14°F) or more.
If the conditions are met, the ECM then checks if the ATF temperature is less than 20°C (68°F). If so, the ECM interprets this as a fault and illuminates the MIL.
Case 2 (2 trip detection logic):
First, the ECM checks for the following conditions:
(a) ECT is 60°C (140°F) or more.
(b) After starting the engine and a certain period of time has elapsed, the ECT is less than 35°C (95°F).
If the conditions are met, the ECM then checks if the ATF temperature is 100°C (212°F) or more. If so, the ECM interprets this as a fault and illuminates the MIL.

MONITOR STRATEGY

Related DTCs	P0711: ATF temperature sensor/Rationality check
Required sensors/Components	ATF temperature sensor
Frequency of operation	Continuous
Duration	Condition 1: 3 seconds Condition 2: 10 seconds
MIL operation	2 driving cycles

Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All

The monitor will run whenever this DTC is not present	None P0110-P0113: IAT sensor P0115-P0118: ECT sensor P0710-P0713: Trans fluid temperature sensor

Condition 1

Time after engine start	17 minutes or more
ECT	-15°C (5°F) or more
Driving distance after engine start	9 km (5.6 miles) or more
IAT (12 sec. after engine start)	-10°C (14°F) or more
ECT (12 sec. after engine start)	-10°C (14°F) or more

Condition 2

ECT	60°C (140°F) or more
ECT (12 sec. after engine start)	Less than 35°C (95°F)

TYPICAL MALFUNCTION THRESHOLDS

Condition 1

ATF temperature	Less than 20°C (68°F)

Condition 2

ATF temperature	100°C (212°F) or more

COMPONENT OPERATING RANGE

ATF temperature	Atmospheric temperature - approximately 130°C (266°F)

WIRING DIAGRAM

Refer to DTC P0710 (see page AX-47).

INSPECTION PROCEDURE

HINT:

Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
6. Follow the instructions on the tester and read the DATA LIST.

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
A/T OIL TEMP1	ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 215°C (419°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If value is -40°C (-40°F) or "150°C (302°F) or more", ATF temperature sensor circuit is open or short circuited

HINT:
- When DTC P0712 is output and the tester output is 150°C (302°F) or more, there is a short circuit.
- When DTC P0713 is output and the tester output is -40°C (-40°F), there is an open circuit.
  Measure the resistance between terminal THO1 (THO) and the body ground.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

AX

HINT:
If a circuit related to the ATF temperature sensor becomes open, P0713 is set in approximately 0.5 seconds.
It is not necessary to inspect the circuit when P0711 is set.

1 CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0711)

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
(b) Turn the ignition switch ON and turn the tester ON.
(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs using the tester.

Result

Display (DTC output)	Proceed to
Only P0711 is output	A
P0711 and other DTCs are output	B

HINT:
If any other codes besides P0711 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC OUTPUT**

A

2 CHECK TRANSAXLE FLUID LEVEL

OK:
Automatic transaxle fluid level is correct.

NG → **ADD FLUID**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0717	Input Speed Sensor Circuit No Signal

DESCRIPTION

This sensor detects the rotation speed of the turbine, which shows the input revolution of the transaxle. By comparing the input speed signal (NT) with the counter gear speed sensor signal (NC), the ECM detects the shift timing of the gears and controls the engine torque and hydraulic pressure according to various conditions. As a result, smooth gear shifting is achieved.

DTC No.	DTC Detection Condition	Trouble Area
P0717	ECM detects conditions (a), (b) and (c) continuously for 5 sec. or more (1 trip detection logic): (a) Vehicle speed: 50 km/h (31 mph) or more (b) Park/Neutral position switch (NSW, R and L) is OFF (c) Speed sensor NT: Less than 300 rpm	• Open or short in speed sensor NT circuit • Speed sensor NT • ECM

MONITOR DESCRIPTION

This DTC indicates that a pulse is not output from the speed sensor NT (input speed sensor) or is output only a little. The NT terminal of the ECM detects the revolving signal from the speed sensor (NT) (input RPM). The ECM outputs a gear shift signal comparing the input speed sensor (NT) with the output speed sensor (NC).

While the vehicle is operating in the 2nd, 3rd or O/D gear position with the shift lever on D, if the input shaft revolution is less than 300 rpm*1 and the output shaft revolution is 1,000 rpm or more*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.

HINT:

*1: Pulse is not output or is irregularly output.

*2: The vehicle speed is approximately 50 km/h (31 mph) or more.

MONITOR STRATEGY

Related DTCs	P0717: Speed sensor (NT)/Verify pulse input
Required sensors/Components	Speed sensor (NT), Speed sensor (NC)
Frequency of operation	Continuous
Duration	5 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	P0500: VSS P0748: Shift solenoid SL1 P0778: Shift solenoid SL2 P0982, P0983: Shift solenoid S4
Shift change	Shift change is completed before starting next shift change operation
ECM selected gear	2nd, 3rd or 4th
Output shaft rpm	1,000 rpm or more
NSW switch	OFF
R switch	OFF
L switch	OFF
Engine	Running
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

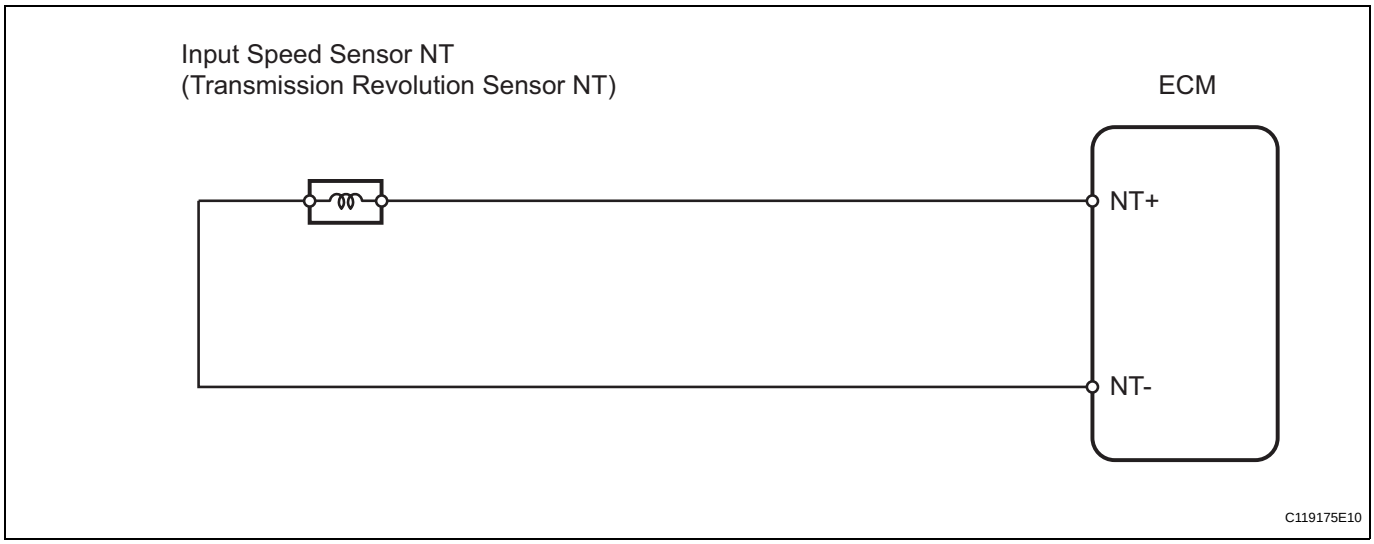
Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

Speed sensor (NT)	Input speed is equal to engine speed when lock-up ON.

AX

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.
NOTICE:
In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
6. Follow the instructions on the tester and read the DATA LIST.

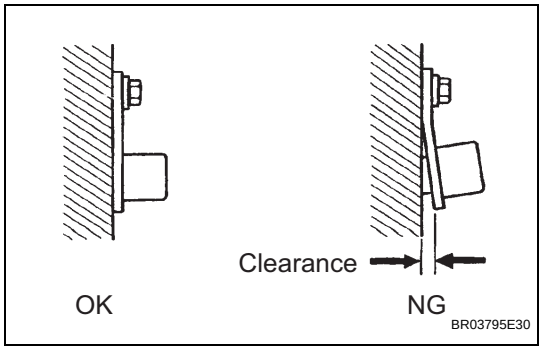
Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
SPD (NT)	Input turbine speed/ Min.: 0 rpm Max.: 12,750 rpm	• Lock-up ON (after warming up engine): Input turbine speed (NT) equal to engine speed. • Lock-up OFF (idling with shift lever on N): Input turbine speed (NT) is nearly equal to engine speed.	Data is displayed in increments of 50 rpm

HINT:

- SPD (NT) is always 0 rpm while driving:
  Open or short in the sensor or circuit.

- SPD (NT) is always more than 0 rpm and less than 300 rpm while driving the vehicle at 50 km/h (31 mph) or more:
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1 INSPECT SPEED SENSOR (INSTALLATION)

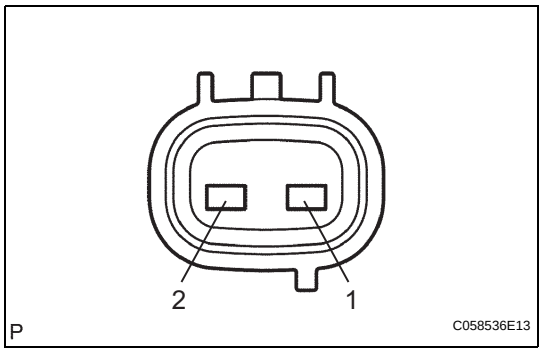


(a) Check the speed sensor NT installation.
OK:
Installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG → **SECURELY INSTALL SENSOR OR REPLACE SPEED SENSOR**

OK

2 INSPECT SPEED SENSOR NT



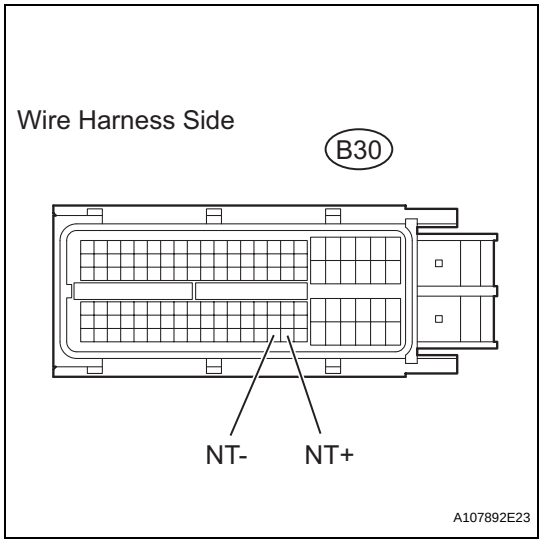
(a) Disconnect the B28 sensor connector from the transaxle.
(b) Measure the resistance of the sensor.
Standard resistance

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

NG → **REPLACE SPEED SENSOR NT**

OK

3 CHECK WIRE HARNESS (SPEED SENSOR - ECM)



(a) Disconnect the B30 ECM connector.
(b) Measure the resistance of the wire harness side connector.
Standard resistance

Tester Connection	Condition	Specified Condition
B30-125 (NT+) - B30-124 (NT-)	20°C (68°F)	560 to 680 Ω
B30-125 (NT+) - Body ground	20°C (68°F)	10 kΩ or higher
B30-124 (NT-) - Body ground	20°C (68°F)	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

DTC	P0724	Brake Switch "B" Circuit High

DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling while driving in the lock-up condition when the brakes are suddenly applied.
When the brake pedal is depressed, this switch sends a signal to the ECM. Then the ECM cancels the operation of the lock-up clutch while braking is in progress.

DTC No.	DTC Detection Condition	Trouble Area
P0724	Stop light switch remains ON even when vehicle is driven in GO (30 km/h (18.63 mph) or more) and STOP (less than 3 km/h (1.86 mph)) pattern 5 times (2 trip detection logic)	• Short in stop light switch signal circuit • Stop light switch • ECM

MONITOR DESCRIPTION

This DTC indicates that the stop light switch remains ON. When the stop light switch remains ON during GO and STOP driving, the ECM interprets this as a fault in the stop light switch. Then the MIL illuminates and the ECM stores the DTC. The vehicle must GO (30 km/h (18.63 mph) or more) and STOP (less than 3 km/h (1.86 mph)) 5 times for 2 driving cycles in order for the DTC to be output.

MONITOR STRATEGY

Related DTCs	P0724: Stop light switch/Range check/Rationality
Required sensors/Components	Stop light switch, Vehicle speed sensor
Frequency of operation	Continuous
Duration	GO and STOP 5 times
MIL operation	2 driving cycles
Sequence of operation	None

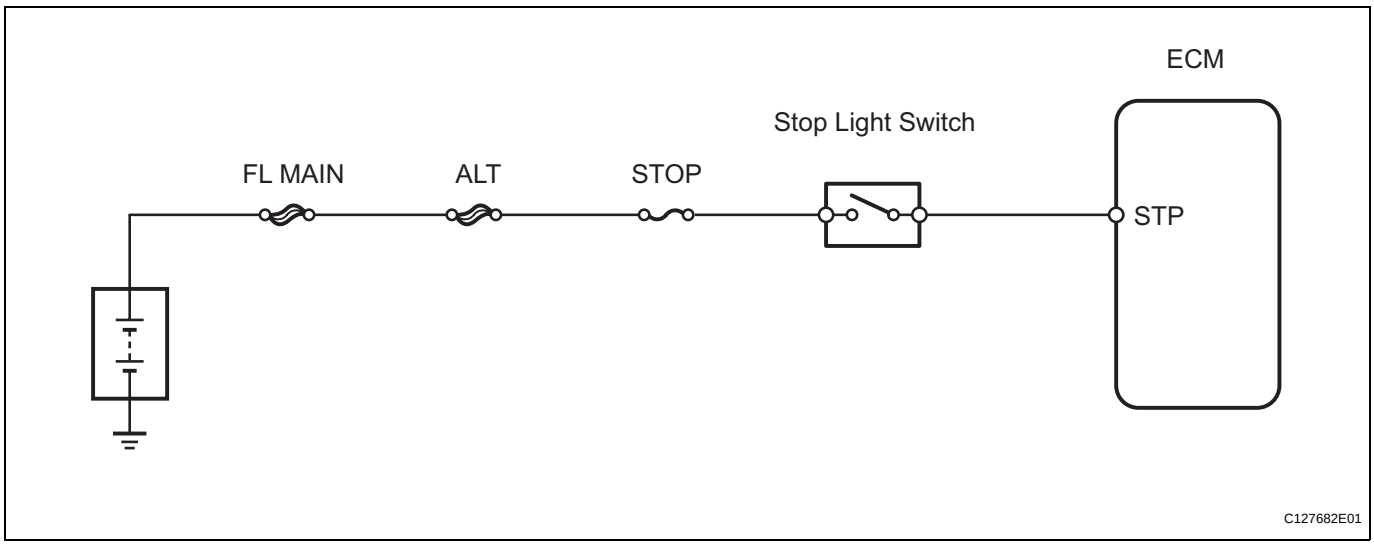
TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Battery voltage	8 V or more
Starter	OFF
Ignition switch	ON
GO (Vehicle speed is 30 km/h (18.63 mph) or more)	Once
STOP (Vehicle speed is less than 3 km/h (1.86 mph))	Once

TYPICAL MALFUNCTION THRESHOLDS

Brake switch	Stuck ON

WIRING DIAGRAM



AX

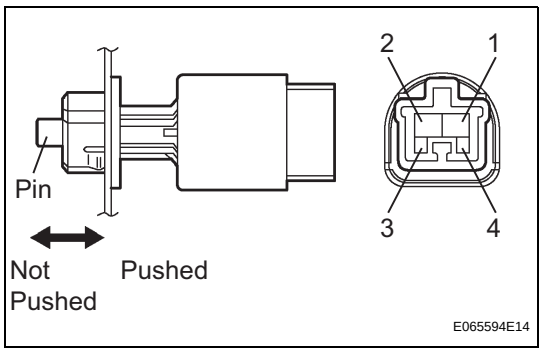
INSPECTION PROCEDURE

HINT:
Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.
NOTICE:
In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
6. Follow the instructions on the tester and read the DATA LIST.

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light switch status/ ON or OFF	• Brake pedal is depressed: ON • Brake pedal is released: OFF	-

1	INSPECT STOP LIGHT SWITCH



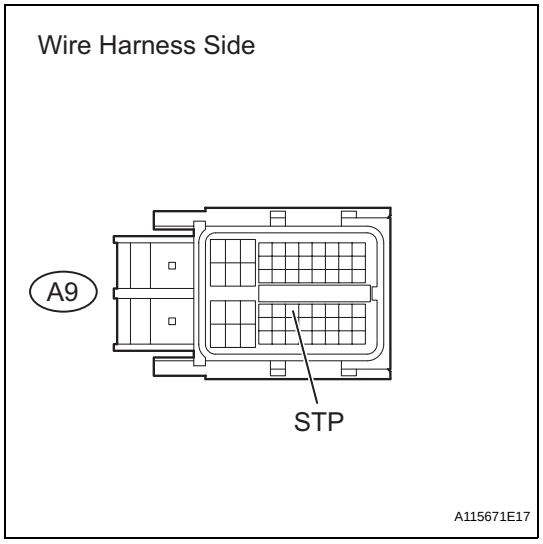
(a) Remove the A3 stop light switch.
(b) Measure the resistance of the switch.
Standard resistance

Tester Connection	Switch Condition	Specified Condition
1 - 2	Pin pushed (pedal released)	Below 1 Ω
1 - 2	Pin not pushed (pedal depressed)	10 kΩ or higher
3 - 4	Pin pushed (pedal released)	10 kΩ or higher
3 - 4	Pin not pushed (pedal depressed)	Below 1 Ω

NG → REPLACE STOP LIGHT SWITCH

OK

2	CHECK WIRE HARNESS (ECM - BATTERY)



(a) Measure the voltage of the wire harness side connector.
Standard voltage

Tester Connection	Condition	Specified Condition
A9-36 (STP) - Body ground	Brake pedal is depressed	10 to 14 V
A9-36 (STP) - Body ground	Brake pedal is released	Below 1 V

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

AX

DTC	P0741	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve DSL)

DESCRIPTION

The ECM uses the signals from the throttle position sensor, air-flow meter, turbine (input) speed sensor, intermediate (counter) shaft speed sensor and crankshaft position sensor to monitor the engagement condition of the lock-up clutch.

AX

Then the ECM compares the engagement conditions of the lock-up clutch with the lock-up schedule in the ECM memory to detect mechanical problems of the shift solenoid valve DSL, valve body and torque converter clutch.

DTC No.	DTC Detection Condition	Trouble Area
P0741	Lock-up does not occur when driving in lock-up range Lock-up remains ON in lock-up OFF range (2 trip detection logic)	• Shift solenoid valve DSL remains open or closed • Valve body is blocked • Shift solenoid valve DSL • Torque converter clutch • Automatic transaxle (clutch, brake, gear, etc.) • Line pressure is too low • ECM

MONITOR DESCRIPTION

Torque converter lock-up is controlled by the ECM based on the speed sensor (NT), speed sensor (NC), engine rpm, engine load, engine temperature, vehicle speed, transmission temperature and gear selection.

The ECM determines the lock-up status of the torque converter by comparing the engine rpm (NE) to the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm control voltage to counter gear rpm (NC). When conditions are appropriate, the ECM requests "lock-up" by applying control voltage to the shift solenoid valve DSL. When the DSL is turned on, it applies pressure to the lock-up relay valve and locks the torque converter clutch.

If the ECM detects no lock-up after lock-up has been requested or if it detects lock-up when it is not requested, the ECM interprets this as a fault in the shift solenoid valve DSL or lock-up system performance.

The ECM will illuminate the MIL and store the DTC.

Example:

When any of the following is met, the system judges it as a malfunction.

1. There is a difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up.
   (Engine speed is at least 100 rpm greater than input turbine speed.)
2. There is no difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up OFF.
   (The difference between engine speed and input turbine speed is less than 35 rpm.)

MONITOR STRATEGY

Related DTCs	P0741: Shift solenoid valve DSL/OFF malfunction Shift solenoid valve DSL/ON malfunction
Required sensors/Components	Shift solenoid valve DSL, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE), Throttle position sensor (VPA1), Mass air flow sensor (MAF), Transmission temperature sensor (THO1), Engine coolant temperature sensor (ECT)
Frequency of operation	Continuous

Duration	OFF malfunction 3.5 sec. ON malfunction 1.8 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All

The monitor will run when ever this DTC is no present	P0115-P0118: ECT sensor P0125: Insufficient ECT for Closed Loop P0500: VSS P0748-P0799: Trans solenoid (range)
Transmission range	"D"
ECT (Engine coolant temperature)	60°C (140°F) or higher
ATF temperature	-20°C (-4°F) or higher
ATF temperature sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction
Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction

ECM lock-up command	ON
ECM selected gear	3rd or 4th
Vehicle speed	25 km/h (15.5 mph) or more

ON malfunction

ECM lock-up command	OFF
ECM selected gear	3rd or 4th
Vehicle speed	25 to 60 km/h (15.5 to 37.2 mph)
Throttle valve opening angle	8% or more

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met: OFF malfunction or ON malfunction

OFF malfunction

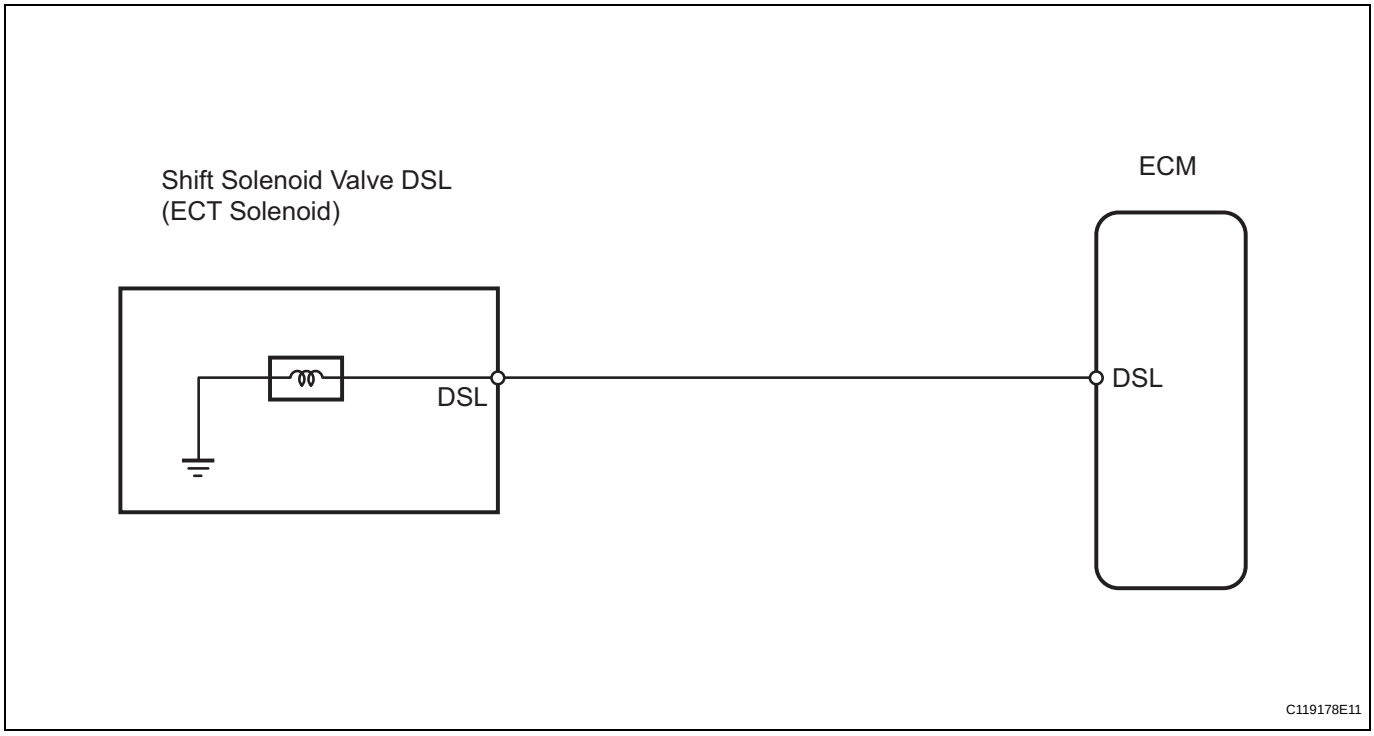
Engine speed - input (turbine) speed	100 rpm or more

ON malfunction

2 detections are necessary per driving cycle:
1st detection: temporary flag ON
2nd detection: pending fault code ON
Vehicle speed must be under 10 km/h (6.2 mph) once before 2nd detection

Difference between engine speed and input (turbine) speed	Less than 35 rpm

WIRING DIAGRAM



INSPECTION PROCEDURE

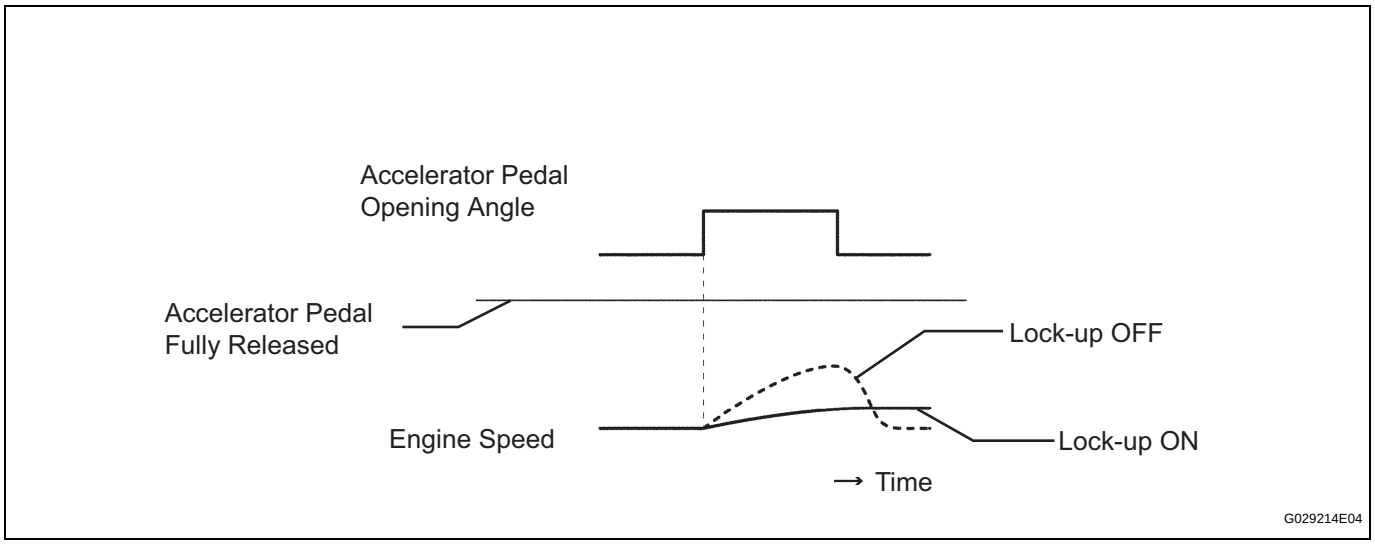
HINT:
Performing the intelligent tester's ACTIVE TEST allows relay, VSV, actuator and other items to be operated without removing any parts. Performing the ACTIVE TEST early in troubleshooting is one way to save time.
The DATA LIST can be displayed during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
6. Follow the instructions on the tester and read the ACTIVE TEST.

Item	Test Detail	Diagnostic Note
LOCK UP	[Test Details] Control shift solenoid DSL to set automatic transaxle to the lock-up condition [Vehicle Condition] • Throttle valve opening angle: Less than 35% • Vehicle speed: 60 km/h (36 mph) or more	Possible to check shift solenoid valve DSL operation

HINT:
- This test can be conducted when the vehicle speed is 60 km/h (36 mph) or more.
- This test can be conducted in the 3rd or O/D gear.

7. Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.
HINT:
- When changing the accelerator pedal opening angle while driving, if the engine speed does not change, lock-up is ON.
- Slowly release the accelerator pedal in order to decelerate. (Do not fully release the pedal as that will close the throttle valve and lock-up may be turned OFF.)



AX

1	CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0741)

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
(b) Turn the ignition switch ON and turn the tester ON.
(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs using the tester.

Result

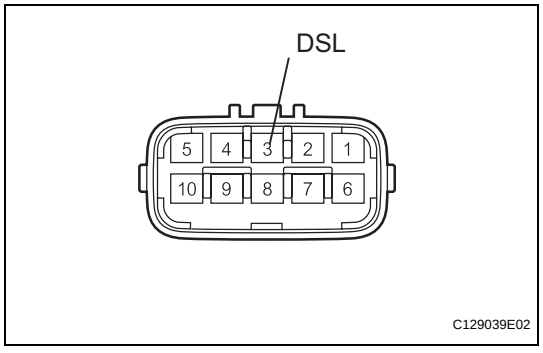
Display (DTC output)	Proceed to
Only P0741 is output	A
P0741 and other DTCs are output	B

HINT:
If any other codes besides P0741 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART**

A

2	INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE DSL)



(a) Disconnect the B27 wire connector.
(b) Measure the resistance of the transmission wire.

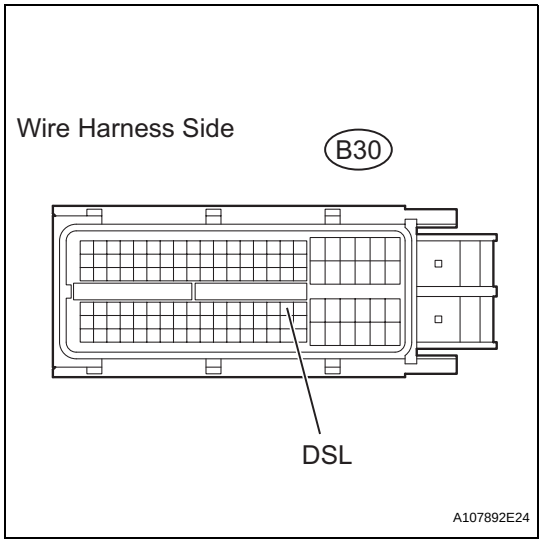
Standard resistance

Tester Connection	Condition	Specified Condition
3 (DSL) - Body ground	20°C (68°F)	11 to 13 Ω

NG → **Go to step 4**

OK

3	CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)



(a) Disconnect the B30 ECM connector.
(b) Measure the resistance of the wire harness side connector.
Standard resistance

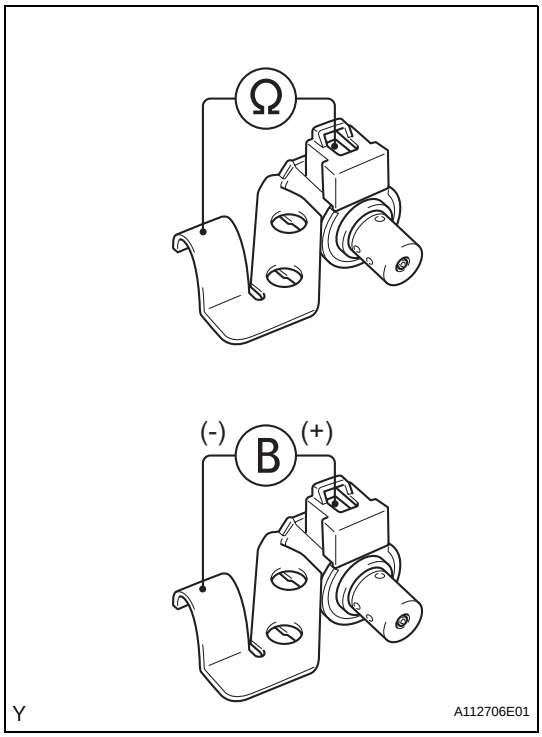
Tester Connection	Condition	Specified Condition
B30-79 (DSL) - Body ground	20°C (68°F)	11 to 13 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

4	INSPECT SHIFT SOLENOID VALVE DSL



(a) Remove the shift solenoid valve DSL.
(b) Measure the resistance of the solenoid valve.
Standard resistance:
11 to 13 Ωat 20°C (68°F)
(c) Connect the battery's positive (+) lead to the terminal of the solenoid valve connector, and the negative (-) lead to the solenoid body. Then check that the valve moves and makes an operating noise.
OK:
Valve moves and makes operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE DSL**

OK

5	CHECK TRANSMISSION WIRE

OK:
The connectors and pins are securely installed.
There is no open or short on the wire harness.

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

6	INSPECT TRANSMISSION VALVE BODY ASSEMBLY

(a) Check the transmission valve body assembly.
OK:
There are no foreign objects on each valve.

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY**

OK

7	INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Check the torque converter clutch assembly (see page AX-152).
OK:
The torque converter clutch operates normally.

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK

REPAIR AUTOMATIC TRANSAXLE ASSEMBLY

DTC	P0746	Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)

DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear).

AX

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transaxle (clutch, brake, gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0746	Gear required by the ECM does not match the actual gear when driving (2 trip detection logic)	• Shift solenoid valve SL1 remains open or closed • Valve body is blocked • Shift solenoid valve SL1 • Automatic transaxle (clutch, brake, gear, etc.) • ECM

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. According to the input shaft revolution, intermediate (counter) shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd or O/D gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL.

Example:

When either condition (a) or (b) is met, the ECM detects a malfunction.

(a) The ECM commands the 1st gear, but the actual gear is 2nd.

(b) The ECM commands the 2nd gear, but the actual gear is 1st.

MONITOR STRATEGY

Related DTCs	P0746: Shift solenoid valve SL1/OFF malfunction Shift solenoid valve SL1/ON malfunction
Required sensors/Components	Shift solenoid valve SL1, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	OFF malfunction, ON malfunction (A) 0.8 sec. ON malfunction (B) 1 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All

Transmission range	"D"
ECT (Engine coolant temperature)	60°C (140°F) or more
ATF temperature	-20°C (-4°F) or more
ATF temperature sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction
Shift solenoid valve SL1 circuit	Not circuit malfunction

Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction

ECM selected gear	1st
Vehicle speed	10 to 40 km/h (6.2 to 24.9 mph)
Throttle valve opening angle	4.5% or more (varies with engine speed)

ON malfunction (A)

ECM selected gear	2nd
Vehicle speed	10 km/h (6.2 mph) or more
Throttle valve opening angle	4.5% or more (varies with engine speed)

ON malfunction (B)

ECM lock-up command	OFF
ECM selected gear	3rd or 4th

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met:
OFF malfunction, or ON malfunction (A) and (B)
2 detections are necessary per driving cycle:
1st detection: temporary flag ON
2nd detection: pending fault code ON

OFF malfunction

Input (turbine) speed/Intermediated shaft speed	1.49 to 1.63

ON malfunction (A)

Input (turbine) speed/Intermediated shaft speed	2.72 to 2.86

ON malfunction (B)

Engine speed - Input (turbine) speed	250 rpm or more

INSPECTION PROCEDURE

HINT:
Performing the intelligent tester's ACTIVE TEST allows relay, VSV, actuator and other items to be operated without removing any parts. Performing the ACTIVE TEST early in troubleshooting is one way to save time.
The DATA LIST can be displayed during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
6. Follow the instructions on the tester and read the ACTIVE TEST.
   HINT:
   While driving, the shift position can be forcibly changed with the tester. Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (see page AX-31).

Item	Test Detail	Diagnostic Note
SHIFT	[Test Details] Operate shift solenoid valve and set each shift lever position by yourself [Vehicle Condition] • IDL: ON • 50 km/h (31 mph) or less [Other information] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of shift solenoid valves

AX

HINT:
- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or more.
- This shift position commanded by the ECM is shown in the DATA LIST/SHIFT display on the tester.

1 CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0746)

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
(b) Turn the ignition switch ON and turn the tester ON.
(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs using the tester.

Result

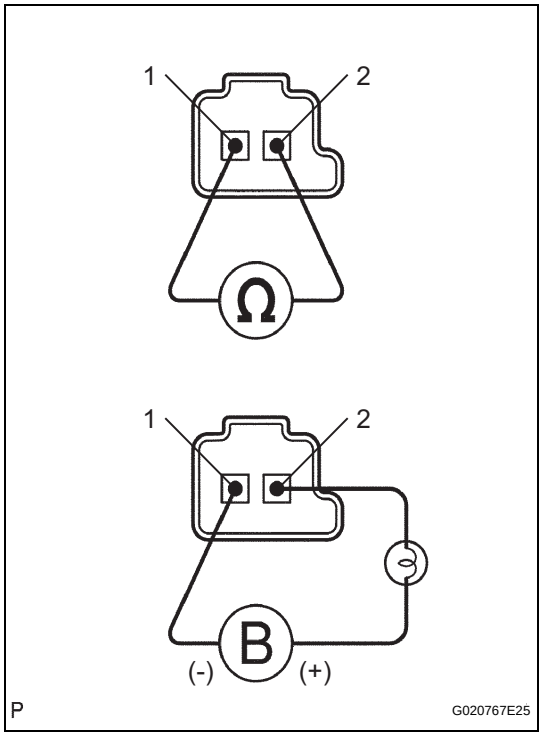
Display (DTC output)	Proceed to
Only P0746 is output	A
P0746 and other DTCs are output	B

HINT:
If any other codes besides P0746 are output, perform the troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

2	INSPECT SHIFT SOLENOID VALVE SL1



(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance of the solenoid valve.
Standard resistance:
5.0 to 5.6 Ωat 20°C (68°F)
(c) Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.
OK:
Valve moves and makes operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE SL1**

OK

3	INSPECT TRANSMISSION VALVE BODY ASSEMBLY

(a) Check the transmission valve body assembly.
OK:
There are no foreign objects on each valve.

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY**

OK

4	INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Check the torque converter clutch assembly (see page AX-152).
OK:
The torque converter clutch operates normally.

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY

DTC	P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)

DESCRIPTION

Shifting from 1st to O/D is performed in combination with the ON and OFF operation of the shift solenoid valves SL1 and SL2, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (see page AX-31).

DTC No.	DTC Detection Condition	Trouble Area
P0748	Duty cycle to shift solenoid valve SL1 is 100% (1 trip detection logic)	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL1 circuit. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. Also, the ECM performs the fail-safe function and turns the other normal shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the circuit (see page AX-31).

MONITOR STRATEGY

Related DTCs	P0748: Shift solenoid valve SL1/Range check
Required sensors/Components	Shift solenoid valve SL1
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Battery voltage	11 V or more
Starter	OFF
Ignition switch	ON

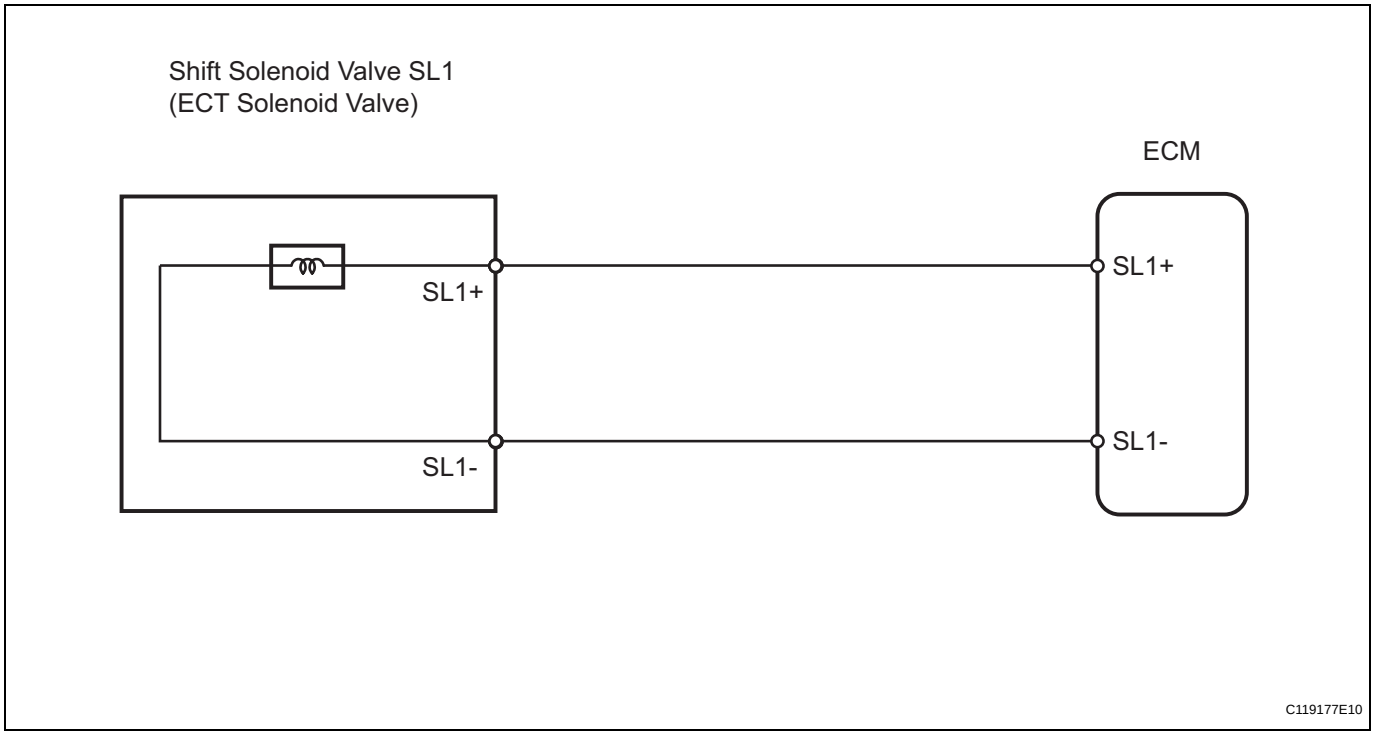
TYPICAL MALFUNCTION THRESHOLDS

Solenoid status	Fail

COMPONENT OPERATING RANGE

Output signal duty	Less than 100%

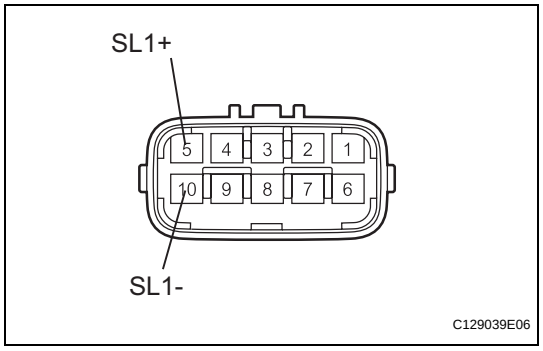
WIRING DIAGRAM



AX

INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL1)



(a) Disconnect the B27 wire connector.
(b) Measure the resistance of the transmission wire.

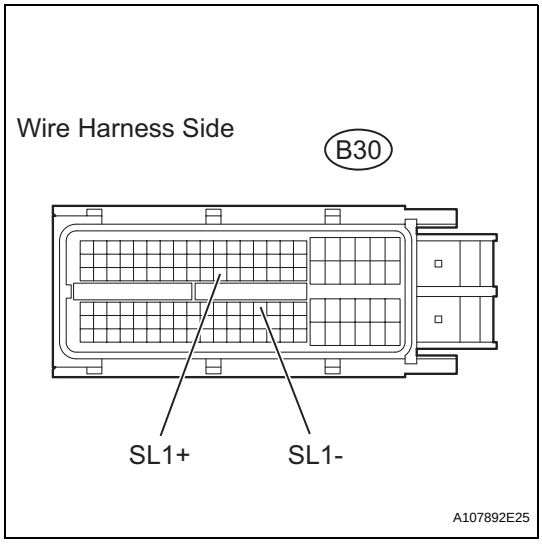
Standard resistance

Tester Connection	Condition	Specified Condition
5 (SL1+) - 10 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
5 (SL1+) - Body ground	20°C (68°F)	1 MΩ or higher
10 (SL1-) - Body ground	20°C (68°F)	1 MΩ or higher

NG → **Go to step 3**

OK

2	CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)



(a) Disconnect the B30 ECM connector.
(b) Measure the resistance of the wire harness side connector.
Standard resistance

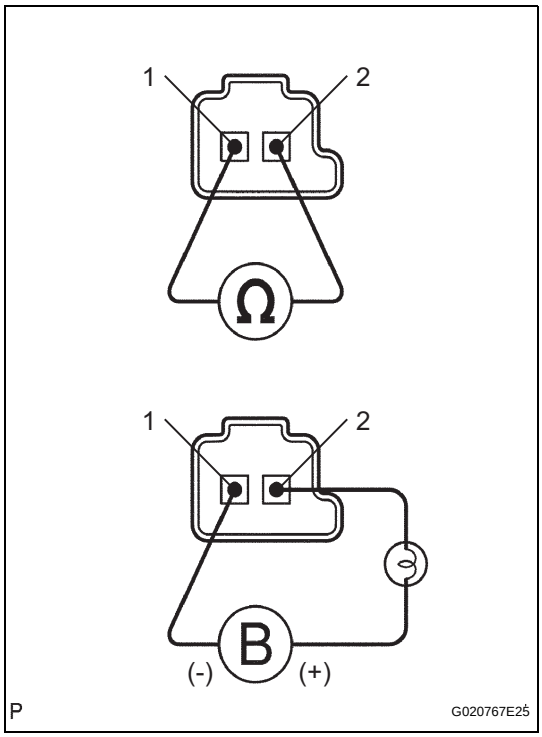
Tester Connection	Condition	Specified Condition
B30-57 (SL1+) - B30-77 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
B30-57 (SL1+) - Body ground	20°C (68°F)	1 MΩ or higher
B30-77 (SL1-) - Body ground	20°C (68°F)	1 MΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE SL1



(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance of the solenoid valve.
Standard resistance:
5.0 to 5.6 Ωat 20°C (68°F)
(c) Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.
OK:
Valve moves and makes operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE SL1**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0766	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)

SYSTEM DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transaxle (clutch, brake, gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0766	Gear required by the ECM does not match the actual gear when driving (2 trip detection logic)	• Shift solenoid valve S4 remains open or closed • Valve body is blocked • Shift solenoid valve S4 • Automatic transaxle (clutch, brake, gear, etc.) • ECM

MONITOR DESCRIPTION

This DTC indicates a stuck OFF malfunction of the shift solenoid valve S4, stuck ON malfunction of the shift solenoid valve SL2, or brake control valve malfunction. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0766: Shift solenoid valve S4/ON malfunction Shift solenoid valve S4/OFF malfunction
Required sensors/Components	Shift solenoid valve S4, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All

Transmission range	"D"
ECT (Engine coolant temperature)	60°C (140°F) or more
ATF temperature	-20°C (-4°F) or more
ATF temperature circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction
Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Electric throttle control system	Not circuit malfunction

OFF malfunction

ECM selected gear	4th

Vehicle speed	10 km/h (6.2 mph) or more
Throttle valve opening angle	5% or more

ON malfunction

ECM selected gear	3rd
Vehicle speed	10 km/h (6.2 mph) or more
Throttle valve opening angle	5% or more

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met:
OFF malfunction or ON malfunction
2 detections are necessary per driving cycle:
1st detection: temporary flag ON
2nd detection: pending fault code ON

OFF malfunction

Intermediate shaft speed/Output speed	1.34 to 1.48

ON malfunction

Intermediate shaft speed/Output speed	0.95 to 1.09

INSPECTION PROCEDURE

HINT:
Performing the intelligent tester's ACTIVE TEST allows relay, VSV, actuator and other items to be operated without removing any parts. Performing the ACTIVE TEST early in troubleshooting is one way to save time.
The DATA LIST can be displayed during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
6. Follow the instructions on the tester and perform the ACTIVE TEST.

HINT:
While driving, the shift position can be forcibly changed with the tester.
Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (see page AX-31).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift lever position by yourself [Vehicle Condition] • IDL: ON • 50 km/h (31 mph) or less [Other information] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The shift position commanded by the ECM is shown in the DATA LIST/SHIFT display on the tester.

1	CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0766)

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
(b) Turn the ignition switch ON and turn the tester ON.
(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs using the tester.

Result

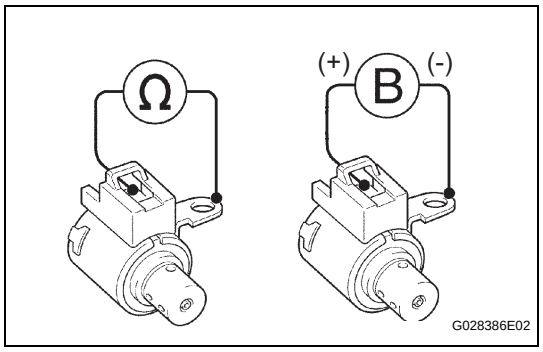
Display (DTC output)	Proceed to
Only P0766 is output	A
P0766 and other DTCs are output	B

HINT:
If any other codes besides P0766 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART**

A

2	INSPECT SHIFT SOLENOID VALVE S4



(a) Remove the shift solenoid valve S4.
(b) Measure the resistance between the solenoid valve terminal and solenoid valve body.
Standard resistance:
11 to 15 Ω at 20°C (68°F)
(c) Connect the battery's positive (+) lead to the terminal of the solenoid valve connector, and the negative (-) lead to the solenoid body. Then check that the valve moves and makes an operating noise.
OK:
Valve moves and makes operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE S4**

OK

3	INSPECT TRANSMISSION VALVE BODY ASSEMBLY

(a) Check the transmission valve body assembly.
OK:
There are no foreign objects on each valve.

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY**

OK

4	INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Check the torque converter clutch assembly (see page AX-152).

OK:

The torque converter clutch operates normally.

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY

DTC	P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transaxle (clutch, brake, gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0776	Gear required by the ECM does not match the actual gear when driving (2 trip detection logic)	• Shift solenoid valve SL2 remains open • Valve body is blocked • Automatic transaxle (clutch, brake, gear, etc.) • ECM

MONITOR DESCRIPTION

This DTC indicates a stuck ON malfunction or stuck OFF malfunction of the shift solenoid valve SL2.
The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0776: Shift solenoid valve SL2/ON malfunction Shift solenoid valve SL2/OFF malfunction
Required sensors/Components	Shift solenoid valve SL2, Speed sensor (NT), Speed sensor (NO), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	0.8 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All

Transmission range	"D"
ECT (Engine coolant temperature)	60°C (140°F) or more
ATF temperature	-20°C (-4°F) or more
ATF temperature circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction
Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Electric throttle control system	Not circuit malfunction

OFF malfunction

ECM selected gear	1st
Vehicle speed	10 to 40 km/h (6.2 to 24.9 mph)
Throttle valve opening angle	4.5% or more (varies with engine speed)

ON malfunction

ECM selected gear	3rd or 4th
Vehicle speed	10 km/h (6.2 mph) or more
Throttle valve opening angle	4.5% or more (varies with engine speed)

TYPICAL MALFUNCTION THRESHOLDS

AX

Either of the following conditions is met:
OFF malfunction or ON malfunction
2 detections are necessary per driving cycle:
1st detection: temporary flag ON
2nd detection: pending fault code ON

OFF malfunction

Input (turbine) speed/Intermediate shaft speed	0.93 to 1.07

ON malfunction

Input (turbine) speed/Intermediate shaft speed	1.49 to 1.63

INSPECTION PROCEDURE

HINT:
Performing the intelligent tester's ACTIVE TEST allows relay, VSV, actuator and other items to be operated without removing any parts. Performing the ACTIVE TEST early in troubleshooting is one way to save time.
The DATA LIST can be displayed during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
6. Follow the instructions on the tester and perform the ACTIVE TEST.

HINT:
While driving, the shift position can be forcibly changed with the tester.
Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (see page AX-31).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift lever position by yourself [Vehicle Condition] • IDL: ON • 50 km/h (31 mph) or less [Other information] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves

HINT:
- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The shift position commanded by the ECM is shown in the DATA LIST/SHIFT display on the tester.

1	**CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0776)**

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
(b) Turn the ignition switch ON and turn the tester ON.

(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs using the tester.
Result

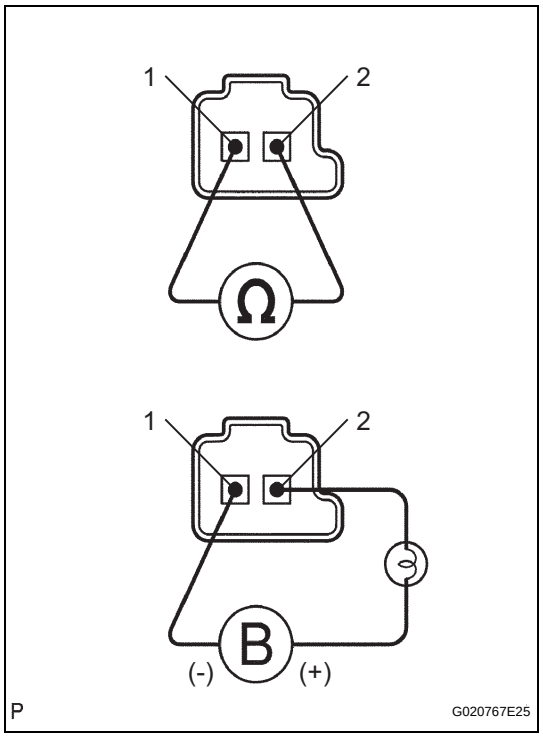
Display (DTC output)	Proceed to
Only P0776 is output	A
P0776 and other DTCs are output	B

HINT:
If any other codes besides P0776 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART**

A

2 INSPECT SHIFT SOLENOID VALVE SL2



(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance of the solenoid valve.
Standard resistance:
5.0 to 5.6 Ωat 20°C (68°F)
(c) Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.
OK:
Valve moves and makes operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE SL2**

OK

3 INSPECT TRANSMISSION VALVE BODY ASSEMBLY

(a) Check the transmission valve body assembly.
OK:
There are no foreign objects on each valve.

NG → **REPAIR TRANSMISSION VALVE BODY ASSEMBLY**

OK

4	INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Check the torque converter clutch assembly (see page AX-152).

OK:

The torque converter clutch operates normally.

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY

DTC	P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)

DESCRIPTION

Shifting from 1st to O/D is performed in combination with the ON and OFF operation of the shift solenoid valves SL1 and SL2, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (see page AX-31).

DTC No.	DTC Detection Condition	Trouble Area
P0778	Duty cycle to shift solenoid valve SL2 is 100% (1 trip detection logic)	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL2 circuit. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. Also, the ECM performs the fail-safe function and turns the other normal shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the circuit (see page AX-31).

MONITOR STRATEGY

Related DTCs	P0778: Shift solenoid valve SL2/Range check
Required sensors/Components	Shift solenoid valve SL2
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Battery voltage	11 V or more
Starter	OFF
Ignition switch	ON

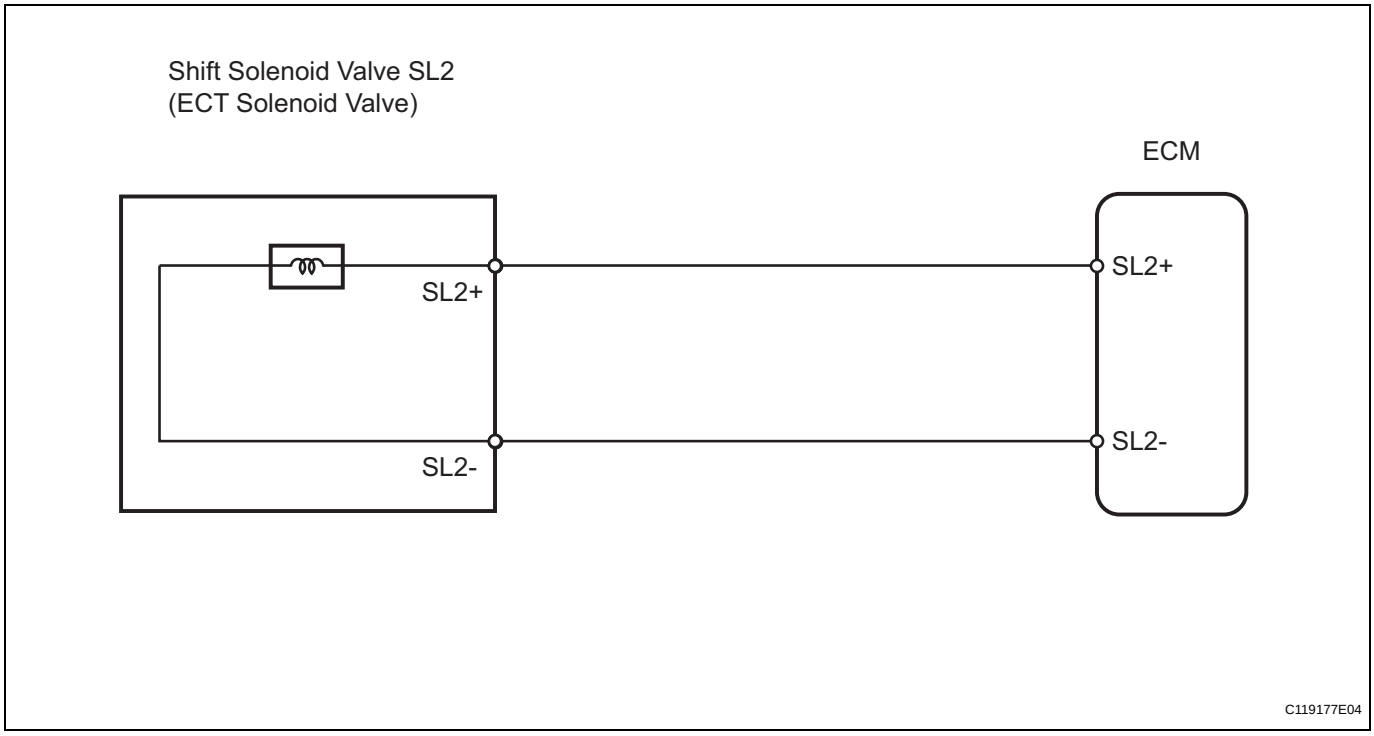
TYPICAL MALFUNCTION THRESHOLDS

Solenoid status	Fail

COMPONENT OPERATING RANGE

Output signal duty	Less than 100%

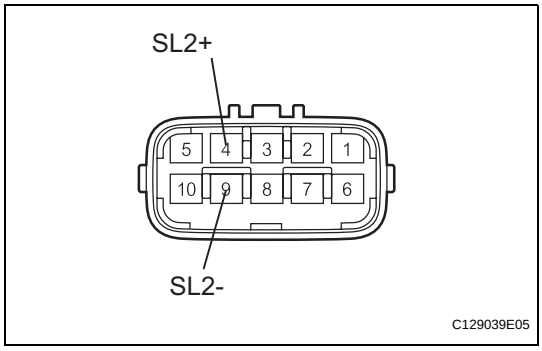
WIRING DIAGRAM



AX

INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL2)



(a) Disconnect the B27 wire connector.
(b) Measure the resistance of the transmission wire.

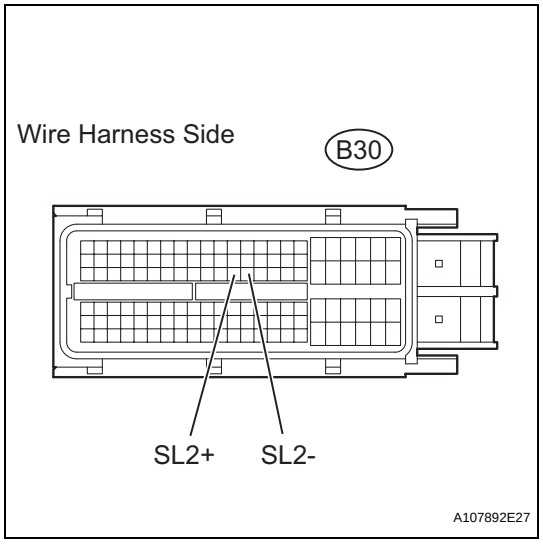
Standard resistance

Tester Connection	Condition	Specified Condition
4 (SL2+) - 9 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
4 (SL2+) - Body ground	20°C (68°F)	1 MΩ or higher
9 (SL2-) - Body ground	20°C (68°F)	1 MΩ or higher

NG → **Go to step 3**

OK

2 CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)



(a) Disconnect the B30 ECM connector.
(b) Measure the resistance of the wire harness side connector.
Standard resistance

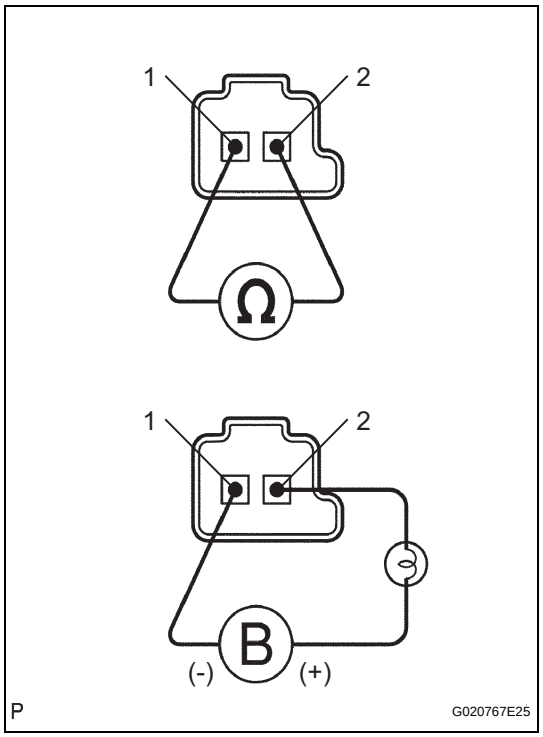
Tester Connection	Condition	Specified Condition
B30-58 (SL2+) - B30-59 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
B30-58 (SL2+) - Body ground	20°C (68°F)	1 MΩ or higher
B30-59 (SL2-) - Body ground	20°C (68°F)	1 MΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE SL2



(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance of the solenoid valve.
Standard resistance:
5.0 to 5.6 Ωat 20°C (68°F)
(c) Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.
OK:
Valve moves and makes operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE SL2**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0793	Intermediate Shaft Speed Sensor "A"

DESCRIPTION

This sensor detects the rotation speed of the counter gear. By comparing the counter gear speed signal (NC) with the direct clutch speed sensor signal (NT), the ECM detects the shift timing of the gears and approximately controls the engine torque and hydraulic pressure according to various conditions. Thus smooth gear shifting is performed.

DTC No.	DTC Detection Condition	Trouble Area
P0793	ECM detects conditions (a) and (b) continuously for 5 sec. or more (1 trip detection logic): (a) Park/Neutral position switch (NSW) is OFF (b) Speed sensor NC: Less than 300 rpm	• Open or short in speed sensor NC circuit • Speed sensor NC • ECM

MONITOR DESCRIPTION

The NC terminal of the ECM detects revolution signals from speed sensor NC (counter gear rpm). The ECM calculates gear shifts by comparing speed sensor NT with speed sensor NC.
While the vehicle is operating in the 2nd, 3rd or O/D gear position with the shift lever on D, if the counter gear revolution is less than 300 rpm*1 and the output shaft revolution is more than 1,000 rpm*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.
*1: Pulse is not output or is irregularly output.
*2: The vehicle speed is 50 km/h (31 mph) or more.

MONITOR STRATEGY

Related DTCs	P0793: Speed sensor (NC)/Verify pulse input
Required sensors/Components	Speed sensor (NC), Speed sensor (NT), NSW switch
Frequency of operation	Continuous
Duration	5 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	P0500: VSS P0748: Shift solenoid SL1 P0778: Shift solenoid SL2 P0982, P0983: Shift solenoid S4
Engine	Running
NSW switch	OFF
Output shaft rpm	1,000 rpm or more

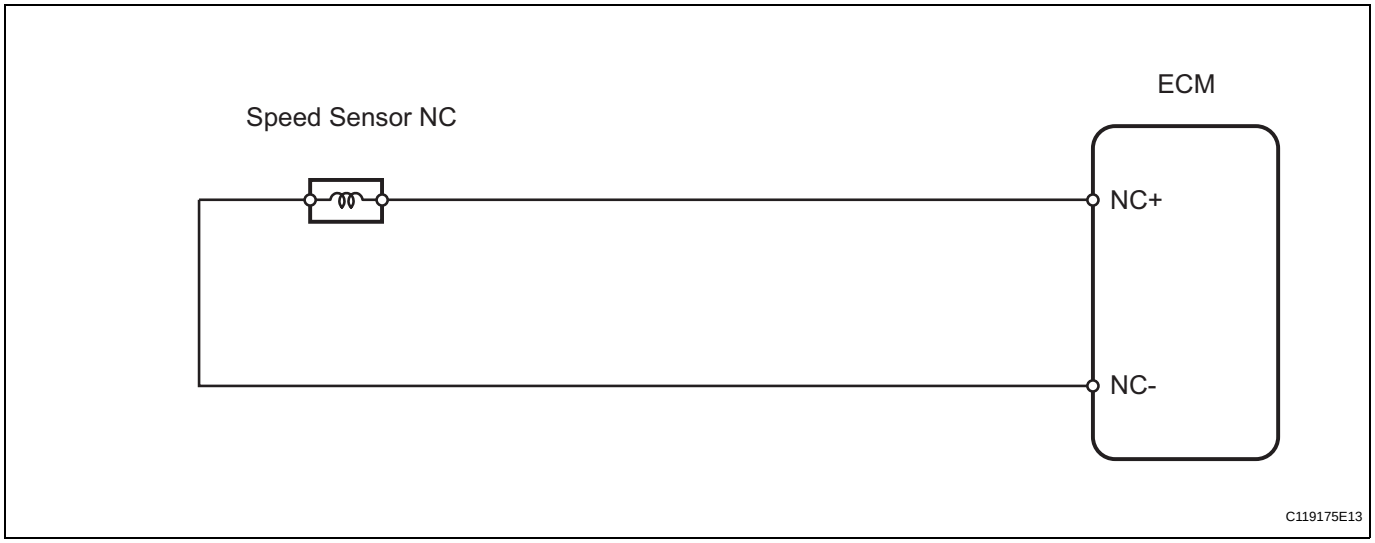
TYPICAL MALFUNCTION THRESHOLDS

Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

Counter gear speed sensor (NC)	4th (O/D) when shift lever is on D (after warming up the engine); Intermediate shaft speed (NC) becomes close to the engine speed

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.
NOTICE:
In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
6. Follow the instructions on the tester and read the DATA LIST.

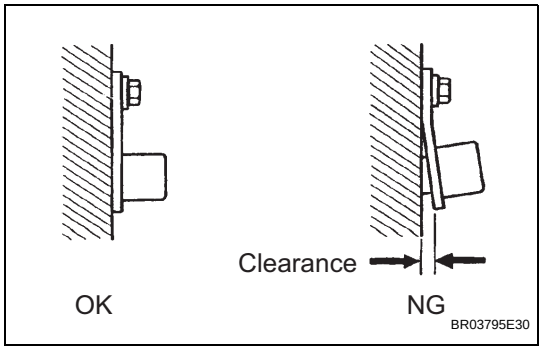
Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
SPD (NC)	Counter gear speed/ Min.: 0 rpm Max.: 12,750 rpm	4th (O/D) when shift lever is on D (after warming up the engine); Intermediate shaft speed (NC) becomes close to the engine speed	Data is displayed in increments of 50 rpm

HINT:

- SPD (NC) is always 0 rpm while driving:
  Open or short in the sensor or circuit.
- SPD (NC) is always more than 0 and less than 300 rpm while driving the vehicle at 50 km/h (31 mph) or more:
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

AX

1	INSPECT SPEED SENSOR (INSTALLATION)

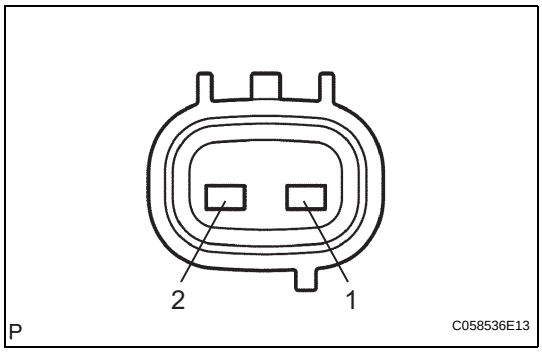


(a) Check the speed sensor NC installation.
OK:
Installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG → **REPLACE SPEED SENSOR NC**

OK

2	INSPECT SPEED SENSOR NC



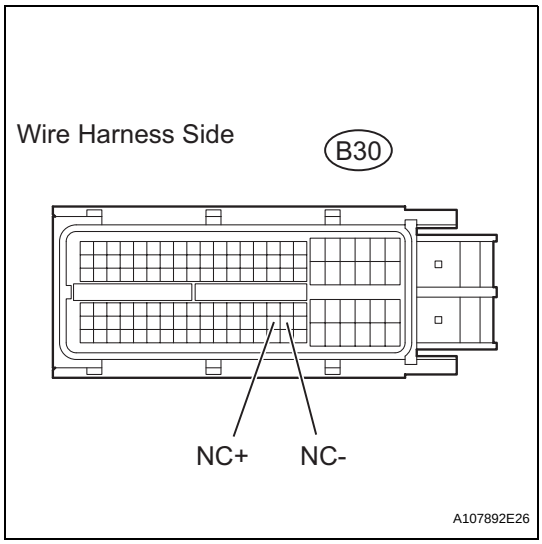
(a) Disconnect the B24 sensor connector from the transaxle.
(b) Measure the resistance of the sensor.
Standard resistance

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

NG → **REPLACE SPEED SENSOR NC**

OK

3	CHECK WIRE HARNESS (SPEED SENSOR - ECM)



(a) Disconnect the B30 ECM connector.
(b) Measure the resistance of the wire harness side connector.
Standard resistance

Tester Connection	Specified Condition
B30-101 (NC+) - B30-102 (NC-)	560 to 680 Ω
B30-101 (NC+) - Body ground	10 kΩ or higher
B30-102 (NC-) - Body ground	10 kΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

DTC	P0982	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)

DTC	P0983	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)

AX

DESCRIPTION

Shifting from 1st to O/D is performed in combination with the ON and OFF operation of the shift solenoid valves SL1 and SL2, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (see page AX-31).

DTC No.	DTC Detection Condition	Trouble Area
P0982	ECM detects short in solenoid valve S4 circuit 2 times when solenoid valve S4 is operated (1 trip detection logic)	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983	ECM detects open in solenoid valve S4 circuit 2 times when solenoid valve S4 is not operated (1 trip detection logic)	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve S4 circuit. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. Also, the ECM performs the fail-safe function and turns the other normal shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the circuit (see page AX-31).

MONITOR STRATEGY

Related DTCs	P0982: Shift solenoid valve S4/Range check (Low resistance) P0983: Shift solenoid valve S4/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S4
Frequency of operation	Continuous
Duration	0.128 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0982: Range check (Low resistance)

The monitor will run whenever this DTC is not present.	None
Shift solenoid valve S4	ON
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

P0983: Range check (High resistance)

The monitor will run whenever this DTC is not present	None
Shift solenoid valve S4	OFF
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0982: Range check (Low resistance)

Shift solenoid valve S4 resistance	8 Ω or less

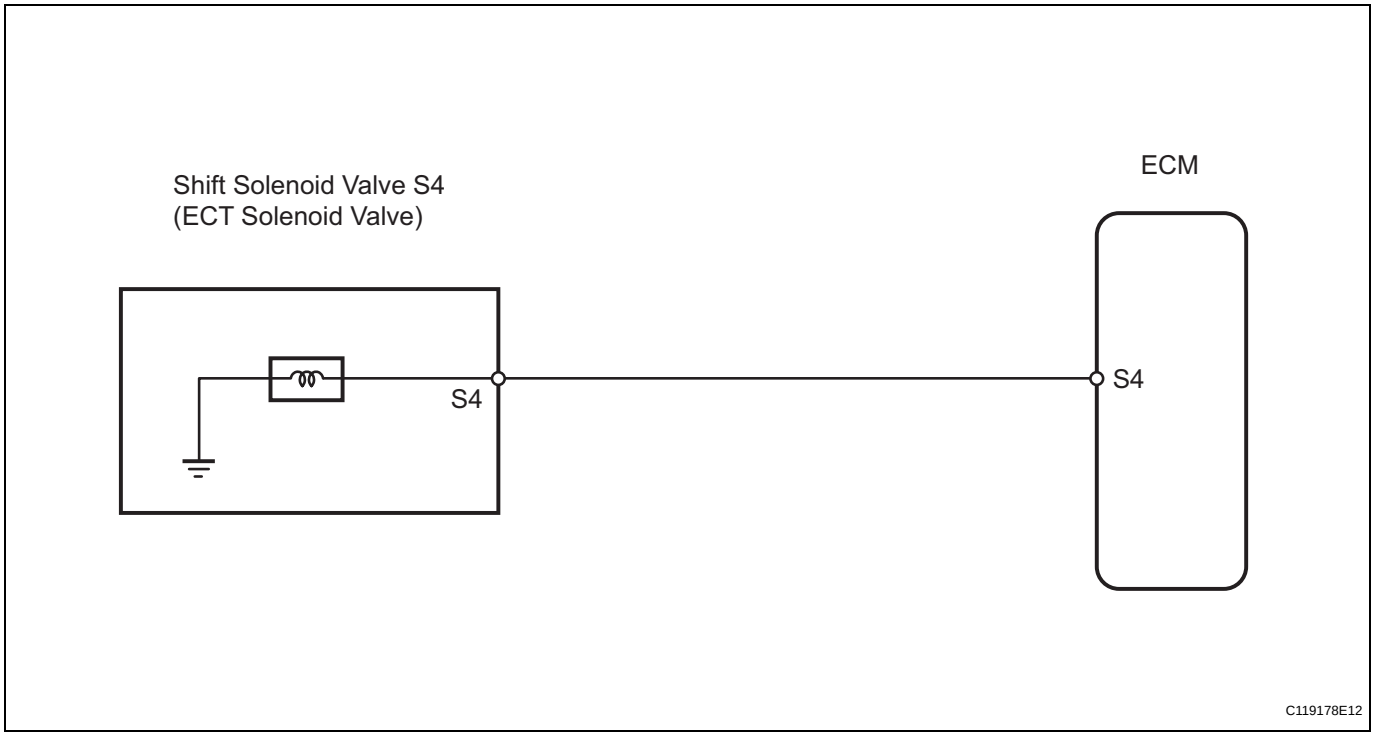
P0983: Range check (High resistance)

Shift solenoid valve S4 resistance	100 kΩ or more

COMPONENT OPERATING RANGE

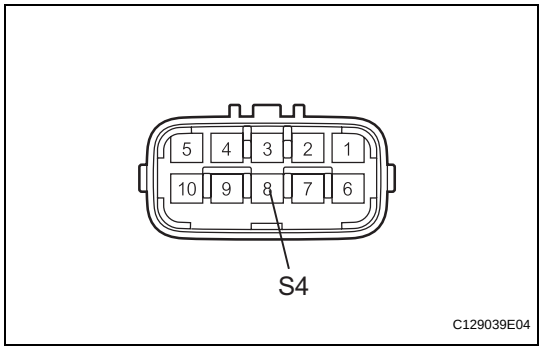
Shift solenoid valve S4	Resistance: 11 to 15 Ω at 20°C (68°F)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE S4)



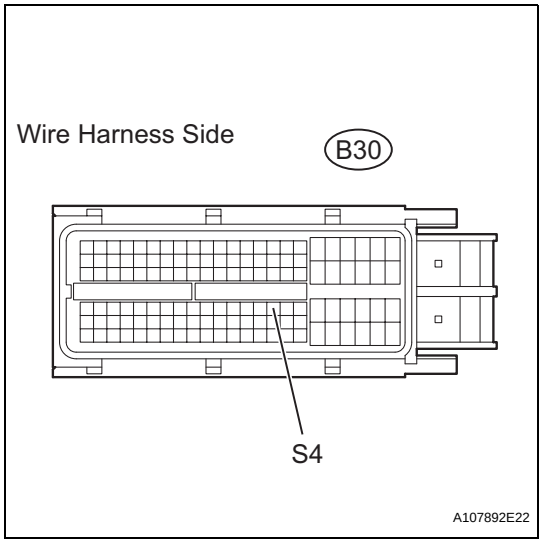
(a) Disconnect the B27 wire connector.
(b) Measure the resistance of the transmission wire.
Standard resistance

Tester Connection	Condition	Specified Condition
8 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

NG → **Go to step 3**

OK

2	CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)



(a) Disconnect the B30 ECM connector.
(b) Measure the resistance of the wire harness side connector.
Standard resistance

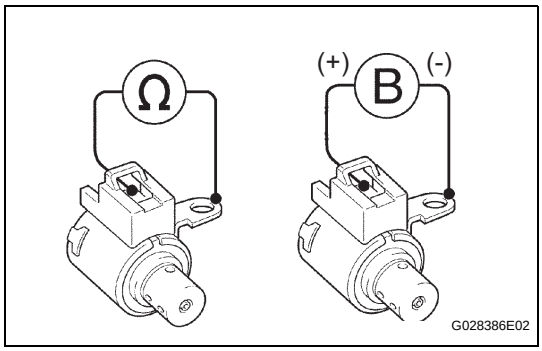
Tester Connection	Condition	Specified Condition
B30-78 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE S4



(a) Remove the shift solenoid valve S4.
(b) Measure the resistance of the solenoid valve.
Standard resistance:
11 to 15 Ω at 20°C (68°F)
(c) Connect the battery's positive (+) lead to the terminal of the solenoid valve connector, and the negative (-) lead to the solenoid body. Then check that the valve moves and makes an operating noise.
OK:
Valve moves and makes operating noise.

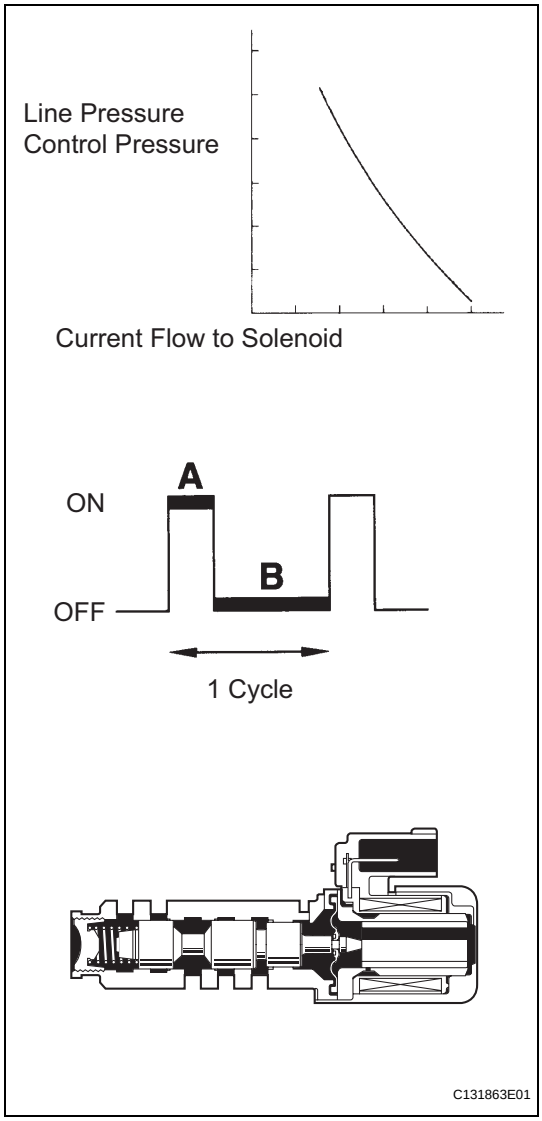
NG → **REPLACE SHIFT SOLENOID VALVE S4**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)

DESCRIPTION



The throttle pressure that is applied to the primary regulator valve (which modulates the line pressure) causes the solenoid valve SLT, under electronic control, to precisely modulate and generate the line pressure according to the extent that the accelerator pedal is depressed or the output of engine power. This controls the line pressure and provides smooth shifting characteristics.
Upon receiving a signal of the throttle valve opening angle, the ECM controls the line pressure by sending a predetermined duty ratio* to the solenoid valve, modulating the line pressure and generating throttle pressure.
HINT:
*: The duty ratio is the ratio of the current ON time (A) to the total of the current ON and OFF time (A + B).
Duty Ratio (%) = A / (A + B) x 100

DTC No.	DTC Detection Condition	Trouble Area
P2714	ECM detects malfunction on SLT (ON side) according to difference in revolutions of turbine (input) and output shaft (2 trip detection logic)	• Shift solenoid valve SLT remains open or closed • Valve body is blocked • Torque converter clutch • Automatic transaxle (clutch, brake or gear etc.) • ECM

AX

MONITOR DESCRIPTION

In any forward position, when the difference between the revolutions of the turbine and output shaft exceeds the specified value (varies with output speed) determined by the ECM, the ECM illuminates the MIL and outputs the DTC. When shift solenoid valve SLT remains on, the oil pressure goes down and the clutch engagement force decreases.

MONITOR STRATEGY

Related DTCs	P2714: Shift solenoid valve SLT/ON malfunction
Required sensors/Components	Shift solenoid valve SLT, Speed sensor (NT), Speed sensor (SPD)
Frequency of operation	Continuous
Duration	1 second
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to ON malfunctions (a), (b), (c) and (d).

The monitor runs whenever the following DTCs are not present	None
Transmission shift position	D
Time after shifting N to D	4.5 seconds or more
ATF (Automatic Transmission Fluid) temperature	-10°C (14°F) or more
ATF temperature sensor (TFT sensor) circuit	No circuit malfunction
Electronic Throttle Control System (if applicable)	No circuit malfunction
Shift solenoid valve S1 circuit	No circuit malfunction
Shift solenoid valve S2 circuit	No circuit malfunction
Shift solenoid valve SLU circuit	No circuit malfunction
Shift solenoid valve SLT circuit	No circuit malfunction
Speed sensor (NT) circuit	No circuit malfunction
Speed sensor (SPD) circuit	No circuit malfunction

ON malfunction (a):

ECM gearshift command	1st
Input (turbine) speed	300 rpm or more
Output speed	300 rpm or more

ON malfunction (b):

ECM gearshift command	2nd
Input (turbine) speed	300 rpm or more
Output speed	300 rpm or more

ON malfunction (c):

ECM gearshift command	3rd
Input (turbine) speed	300 rpm or more
Output speed	300 rpm or more

ON malfunction (d):

ECM gearshift command	4th
Input (turbine) speed	300 rpm or more
Output speed	300 rpm or more

TYPICAL MALFUNCTION THRESHOLDS

[ON malfunction]

Detection condition: Total accumulated time of ON malfunctions (a), (b), (c) and (d) is 1 second or more

ON malfunction (a):

NT - NC x 1st gear ratio (without counter gear and under drive gear) NT: Input (turbine) speed NC: Counter gear speed	More than 300 rpm at counter gear speed of 1,000 rpm (Conditions vary with counter gear speed)
Duration	0.85 seconds or more

ON malfunction (b):

NT - NC x 2nd gear ratio (without counter gear and under drive gear)	More than 300 rpm at counter gear speed of 1,000 rpm (Conditions vary with counter gear speed)
Duration	0.85 seconds or more

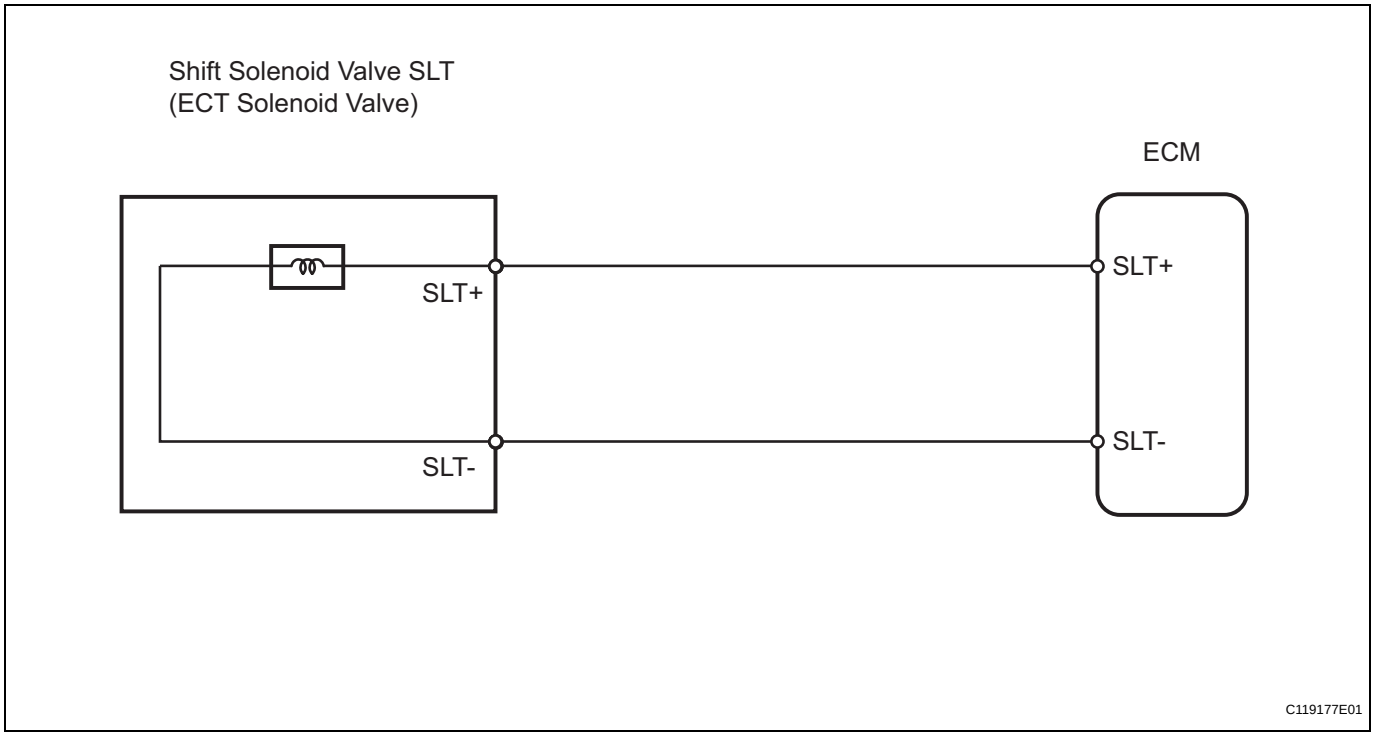
ON malfunction (c):

NT - NC x 3rd gear ratio (without counter gear and under drive gear)	More than 300 rpm at counter gear speed of 1,000 rpm (Conditions vary with counter gear speed)
Duration	0.85 seconds or more

ON malfunction (d):

NC - NO x Counter gear ratio x under drive gear ratio (Low or High)	More than 300 rpm at output speed of 1,000 rpm (Conditions vary with output speed)
Duration	0.85 seconds or more

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Performing the intelligent tester's ACTIVE TEST allows relay, VSV, actuator and other items to be operated without removing any parts. Performing the ACTIVE TEST early in troubleshooting is one way to save time.
The DATA LIST can be displayed during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
6. Perform the ACTIVE TEST.

Item	Test Details	Diagnostic Note
SOLENOID (SLT)*	[Test Details] Operate shift solenoid SLT and raise line pressure [Vehicle Condition] • Vehicle stopped • IDL: ON HINT: OFF: Line pressure up (when Active Test "SOLENOID (SLT)" is performed, ECM commands SLT solenoid to turn OFF) ON: No action (normal operation)	-

HINT:
*: "SOLENOID (SLT)" in the ACTIVE TEST is performed to check the line pressure changes by connecting SST to the automatic transaxle, which is used in the HYDRAULIC TEST (see page AX-16) as well. Please note that the pressure values in the ACTIVE TEST and HYDRAULIC TEST are different.

1 CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P2714)

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
(b) Turn the ignition switch ON and turn the tester ON.
(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read the DTCs using the tester.

Result

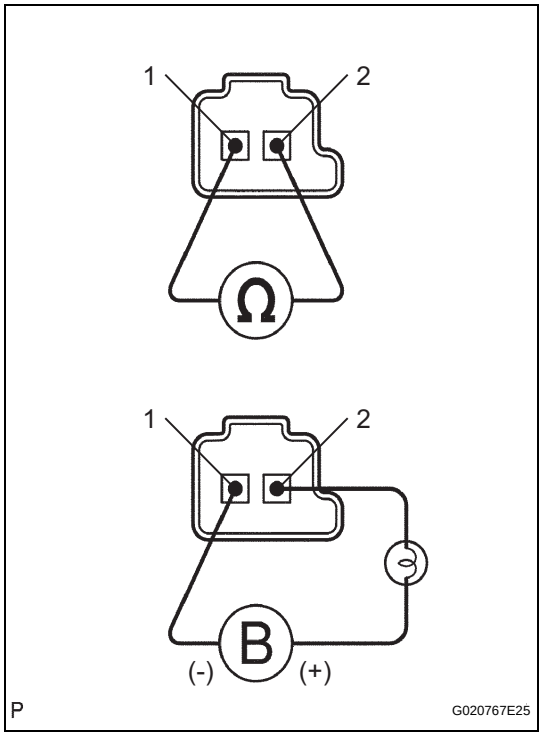
Display (DTC output)	Proceed to
Only P2714 is output	A
P2714 and other DTCs are output	B

HINT:
If any other codes besides P2714 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

2	INSPECT SHIFT SOLENOID VALVE SLT



(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance of the solenoid valve.
Standard resistance:
5.0 to 5.6 Ωat 20°C (68°F)
(c) Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.
OK:
Valve moves and makes operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE SLT**

OK

3	INSPECT TRANSMISSION VALVE BODY ASSEMBLY

(a) Check the transmission valve body assembly.
OK:
There are no foreign objects on each valve.

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY**

OK

4	INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Check the torque converter clutch assembly (see page AX-152).
OK:
The torque converter clutch operates normally.

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY

DTC	P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)

DESCRIPTION

Refer to DTC P2714 (see page AX-91).

DTC No.	DTC Detection Condition	Trouble Area
P2716	Condition (a) and (b) below is detected for 1 sec. or more (1 trip detection logic): (a) SLT - terminal: 0 V (b) SLT - terminal: 12 V	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

MONITOR DESCRIPTION

When an open or short in the shift solenoid valve SLT circuit is detected, the ECM interprets this as a fault. The ECM will illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2716: Shift solenoid valve SLT/Range check
Required sensors/Components	Shift solenoid valve SLT
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Battery voltage	11 V or more
Solenoid current cut status	Not cut
CPU command duty ratio to SLT	19% or more
Starter	OFF
Ignition switch	ON

TYPICAL MALFUNCTION THRESHOLDS

Solenoid status from IC	Fail (open or short)

COMPONENT OPERATING RANGE

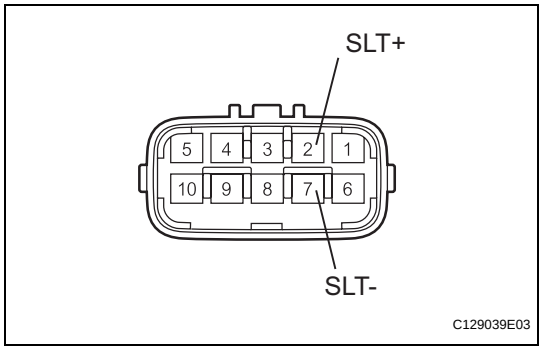
Shift solenoid valve SLT	Resistance: 5.0 to 5.6 Ω at 20°C (68°F)

WIRING DIAGRAM

Refer to DTC P2714 (see page AX-91).

INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SLT)



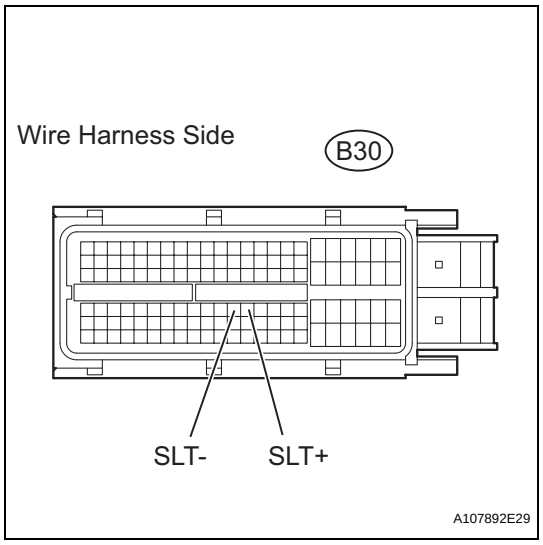
(a) Disconnect the B27 wire connector.
(b) Measure the resistance of the transmission wire.
Standard resistance

Tester Connection	Condition	Specified Condition
2 (SLT+) - 7 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
2 (SLT+) - Body ground	20°C (68°F)	1 MΩ or higher
7 (SLT-) - Body ground	20°C (68°F)	1 MΩ or higher

NG → **Go to step 3**

OK

2 CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)



(a) Disconnect the B30 ECM connector.
(b) Measure the resistance of the wire harness side connector.
Standard resistance

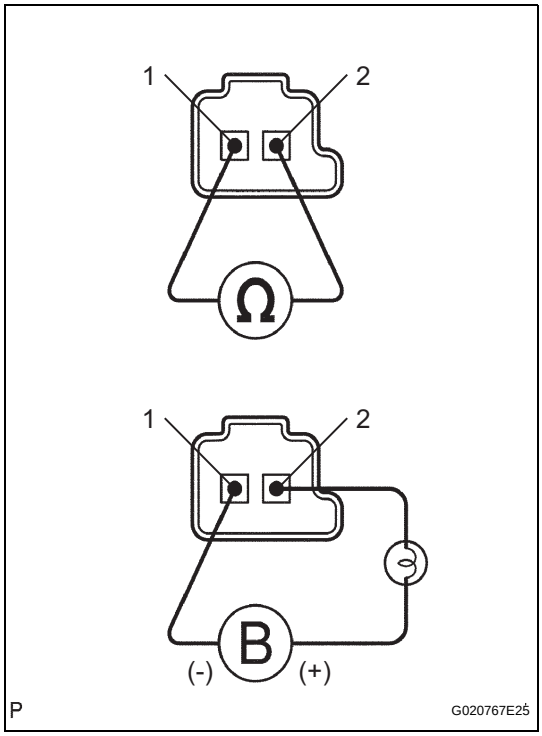
Tester Connection	Condition	Specified Condition
B30-76 (SLT+) - B30-75 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
B30-76 (SLT+) - Body ground	20°C (68°F)	1 MΩ or higher
B30-75 (SLT-) - Body ground	20°C (68°F)	1 MΩ or higher

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE SLT



(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance of the solenoid valve.
Standard resistance:
5.0 to 5.6 Ωat 20°C (68°F)
(c) Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.
OK:
Valve moves and makes operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE SLT**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P2769	Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL)

DTC	P2770	Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve DSL)

DESCRIPTION

The shift solenoid valve DSL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock-up relay valve, which then controls operation of the lock-up clutch.

DTC No.	DTC Detection Condition	Trouble Area
P2769	ECM detects short in shift solenoid valve DSL circuit when shift solenoid valve DSL is operated (2 trip detection logic)	• Short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM
P2770	ECM detects open in shift solenoid valve DSL circuit when shift solenoid valve DSL is not operated (2 trip detection logic)	• Open in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM

Fail-safe function:
If the ECM detects a malfunction, it turns the shift solenoid valve DSL OFF.

MONITOR DESCRIPTION

Torque converter lock-up is controlled by the ECM based on engine rpm, engine load, engine temperature, vehicle speed, transmission temperature, and shift position selection. The ECM determines the lock-up status of the torque converter by comparing the engine rpm (NE) to the input rpm (NT). The ECM calculates the actual transmission gear by comparing the input rpm (NT) to the output rpm (SP2). When conditions are appropriate, the ECM requests "lock-up" by applying control voltage to the shift solenoid valve DSL. When the shift solenoid valve DSL is opened, the shift solenoid valve DSL applies pressure to the lock-up relay valve and locks the torque converter clutch. If the ECM detects an open or short in the shift solenoid valve DSL circuit, the ECM interprets this as a fault in the shift solenoid valve DSL or its circuit. The ECM will illuminate the MIL and store a DTC.

MONITOR STRATEGY

Related DTCs	P2769: Shift solenoid valve DSL/Range check (Low resistance) P2770: Shift solenoid valve DSL/Range check (High resistance)
Requires sensors/Components	Shift solenoid valve DSL
Frequency of operation	Continuous
Duration	0.064 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P2769: Range check (Low resistance)

The monitor will run whenever this DTC is not present	None
Shift solenoid valve DSL	ON
Solenoid current cut status	Not cut
Battery voltage	8 V or more
Starter	OFF
Ignition switch	ON

P2770: Range check (High resistance)

The monitor will run whenever this DTC is not present	None

Shift solenoid valve DSL	ON
Battery voltage	8 V or more
Starter	OFF
Ignition switch	ON

TYPICAL MALFUNCTION THRESHOLDS

AX

P2769: Range check (Low resistance)

Shift solenoid valve DSL resistance	8 Ω or less

P2770: Range check (High resistance)

Shift solenoid valve DSL resistance	100 kΩ or more

COMPONENT OPERATING RANGE

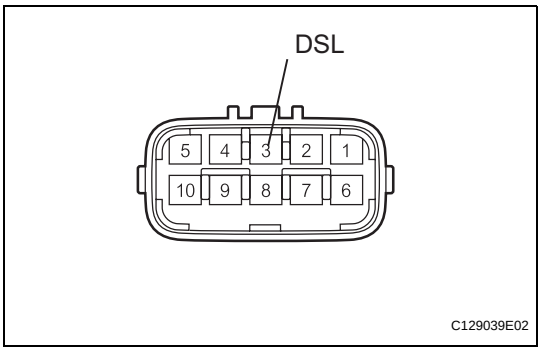
Shift solenoid valve DSL	Resistance: 11 to 13 Ω at 20°C (68°F)

WIRING DIAGRAM

Refer to DTC P0741 (see page AX-62).

INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE DSL)



(a) Disconnect the B27 wire connector.
(b) Measure the resistance of the transmission wire.

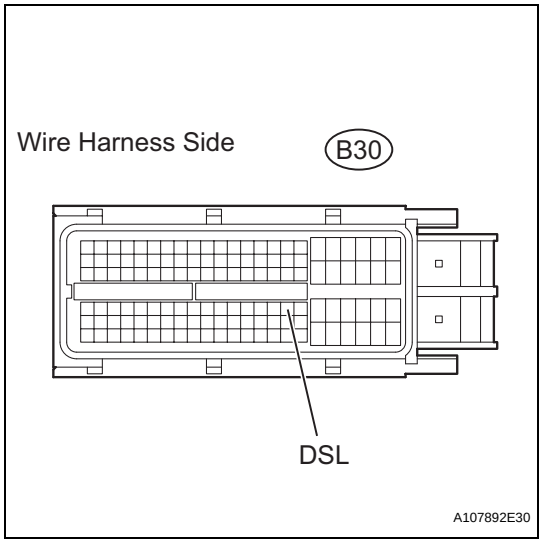
Standard resistance

Tester Connection	Condition	Specified Condition
3 (DSL) - Body ground	20°C (68°F)	11 to 13 Ω

NG → **Go to step 3**

OK

2 CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)



(a) Disconnect the B30 ECM connector.
(b) Measure the resistance of the wire harness side connector.
Standard resistance

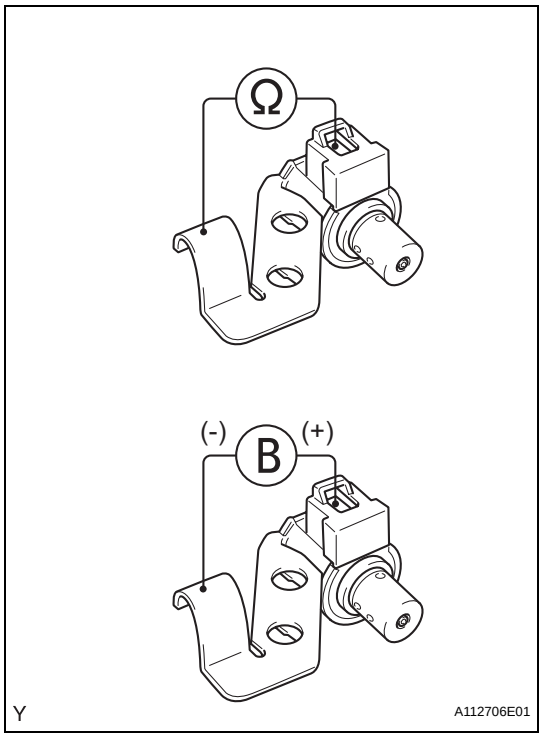
Tester Connection	Condition	Specified Condition
B30-79 (DSL) - Body ground	20°C (68°F)	11 to 13 Ω

NG → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

OK

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE DSL



(a) Remove the shift solenoid valve DSL.
(b) Measure the resistance between the solenoid valve terminal and solenoid valve body.
Standard resistance:
11 to 13 Ω at 20°C (68°F)
(c) Connect the battery's positive (+) lead to the terminal of the solenoid valve connector, and the negative (-) lead to the solenoid body. Then check that the valve moves and makes an operating noise.
OK:
Valve moves and makes operating noise.

NG → **REPLACE SHIFT SOLENOID VALVE DSL**

OK

REPAIR OR REPLACE TRANSMISSION WIRE